



FRIDAY, JAN. 9.

CONTENTS.

PAGE.	PAGE.
ILLUSTRATIONS:	EDITORIAL NOTES.....28-31
Indicator Cards of Compound and Simple Locomotives... 20	NEW PUBLICATIONS..... 31
Useful Articles for a Wrecking Outfit..... 22	TRADE CATALOGUES..... 32
Lentz's Stayless Locomotive Boiler..... 23	GENERAL RAILROAD NEWS:
Ten-Ton Derrick Car—Baltimore & Ohio Railroad..... 24	Locomotive Building..... 33
Details of Ice Houses..... 25	Car Building..... 33
CONTRIBUTIONS:	Bridge Building..... 33
Table for Elevation of Outer Rail 19	Meetings and Announcements 33
Relief of the New York Elevated Roads..... 19	Personal..... 34
The Economy of Not Preventing Accidents..... 19	Elections and Appointments..... 34
Lenses Versus Illuminated Blades..... 19	Railroad Construction..... 35
EDITORIALS:	General Railroad News..... 36
The Prospects of the President's Agreement..... 28	Traffic..... 36
Traffic Affairs in 1890..... 29	MISCELLANEOUS.
Continuous Brakes in England 29	Technical..... 27
The New Railroad Building of 1890 and Some of the Prospects for 1891..... 29	The Scrap Heat..... 32
	The Use of Oil..... 23
	The Development of the South 26
	Iron and other Metals in 1890. 26
	Concerning the American Society of Civil Engineers..... 26
	Unjust Discrimination in England..... 31

Contributions.

Table for Elevation of Outer Rail.

Lehigh Valley Railroad,
Office of Roadmaster,
WHITE HAVEN, Pa., Dec. 23, 1890.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Herewith I send you a print of a table for the run off of the elevation of the outer rail of curves, with a sketch underneath explanatory of same.

The object I had in view in getting up this table was

safely be lessened. Therefore, what improvement can be made must be by lessening the "station time," through greater conveniences for loading and unloading trains.

As now arranged, one crowd of people is standing idle on the platform waiting, while another crowd is debarking. This is not a business operation, if both movements can be carried on simultaneously. Moreover, neither movement is as rapid as it would be if not done in the face of the counter movement or against an opposing crowd. If one movement were carried on at the ends of the cars, the other from doors at the centre, both movements would be more rapid. Where 80 seconds are now required to load and 80 seconds to unload, a total of 160 seconds, the movement by different doors would be accomplished in a total of 60 seconds or perhaps 50 seconds.

Again, the swinging gates at present in use open against the stream of debarking passengers. If passengers entered by the ends of the cars and debarked through sliding doors in the centre of the cars, time would be saved. The one brakeman, by a rope arrangement similar to that of the present station exits, could perhaps attend to both places.

If the gates at the car platforms were folding gates, like those on ferryboats, or if they opened outward, the gateman could stand so near the gates as to keep them well under control and properly locked, and standing room for several passengers would be gained on the platforms.

One other inquiry presents itself: Why are sliding doors practicable and essential in street cars, but hinged doors, opening against the outgoing passengers, in use on the equally crowded elevated cars? Here is another loss of standing room for several persons. By economizing in these items of room, enough would be gained to more than compensate for the loss of room by the use of central doors.

TRAVELER.

The Economy of Not Preventing Accidents.

CHICAGO, Dec. 29, 1890.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Your issue of Dec. 26 provided an antidote for the baneful effects which might have been anticipated from the remarkable letter of Mr. Acworth; and one cannot help

figuring upon the showing you make of killed and injured in train accidents alone. It may not be too much to suppose that each one of these 331 victims of economy, who suffered in November, had five other persons interested in his welfare and more or less dependent upon his earnings. We reckon five to a family to get at our Western census; and the earning capacity of 66 of these unfortunates did then forever cease and determine. If none of these killed and injured were any better than brakemen, their earnings would amount to about \$600 per annum each; so the annual loss from the month's killing would be \$39,600.

Suppose the other 265 to be on the average deprived of their earning power for only half a year; there must be added for surgical attendance and nursing at least an equal sum, amounting, at the before-mentioned rate, to \$159,000, or a total loss of revenue from November's casualties of \$198,600. Multiply this by 12 for the results of a year, and you have a rude approximation to the interest of the capital which our railroads may still invest in safety appliances without any risk of overdoing it.

After these plain pecuniary considerations shall have prevailed, it will be time enough to consider the saving from want and suffering which might be accomplished, the lessened number of widows and orphans and of railroad cripples in the land, but, of course, not until then; the thought is too dreadful!

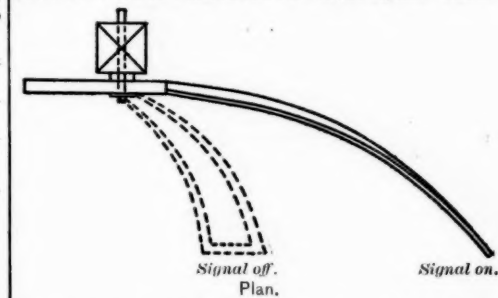
ARCHIMEDES S. WATT, C. E.

Lenses Versus Illuminated Blades.

TO THE EDITOR OF THE RAILROAD GAZETTE:

That position affords a better signal than color has become conditionally an axiom. Colors are not sufficiently distinct to-day, owing principally to the predominance of color, more or less bright, in the background. For instance, there are red bricks, green fields, blue sky, whitewashed boards, etc. On the other hand, ordinary structures are not liable to be mistaken as a whole, or in part, for semaphore signals; the nearest approach to a likeness being the telegraph poles with large cross arms, and in that case an error would be on the side of safety.

Some people seem to have taken it for granted that position would also afford the best night signal. Differ-



ing conditions generally alter cases, and what could differ more in appearance than night and day? It seems, therefore, that we have good reason to challenge the application of the axiom to night signals. The idea of a night position signal of the semaphore type is not new, for it has been before the railroads for some time. Several gentlemen have recently made efforts to convince people that there is a serious defect in the employment of colors for night signaling, and that the proper solution of that problem is the use of the illuminated blade. The result is, that several of these blades are on trial by railroad companies.

Now at night there is a general absence of the bright colors which predominate by day. In fact, there is a general sombre background, against which red and white rays of light make excellent signals if in sufficient volume. It has been conceded, as pointed out in my notes on signal lamps, published in the *Railroad Gazette*, Oct. 24, 1890, that our present lamps do not throw a sufficient volume of light for main line running signals; but by spending one-third as much as the cost of an illuminated blade we can have the proper volume of light. I may here add that, in order that main line night signals may be properly distinguished, it is important that slow route and siding signals should be comparatively dim, because it is almost impossible to compare relative heights at night. Some railroads have accomplished this by using plain ground glass, instead of bull's-eyes, in their slow route lamps. Others have projected the light upward at an angle of about 35 deg.

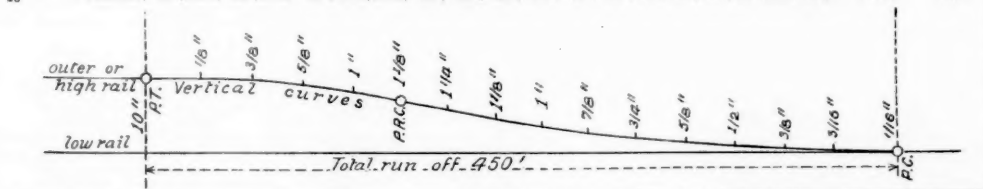
When shown against a background of town lights, the disadvantage of the illuminated blade is greater than that of an efficient lens. My experience has been that an 8½-in. solid lens will throw a column of light of such volume and intensity that, as a signal, it will stand out resplendent and distinct under the most trying conditions. In the illuminated blade there is a lack of intensity at any point in its length, so that a background of moderately strong light is liable to overwhelm the signal.

A very important feature of the day semaphore seems to have been considered by the illuminated blade inventors as quite unnecessary. I refer to the instantaneous comparison of the angle made by the semaphore arm with the semaphore pole. It seems to me that the pole plays an important part as regards the ease and distinctness with which the signal is read. To make a

TABLE FOR RUN-OFF OF ELEVATION OF OUTER RAIL OF CURVES.

Drop in inches for each 30 ft. rail, commencing at theoretical point of curve.

Elevation.	1/4	1/2	3/4	1	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	4 1/4	4 1/2	4 3/4	5	Total.
1 inch.....		30	30													30	30	30	30	30	120
2 ".....		30	30													30	30	30	30	30	150
3 ".....		30	30													30	30	30	30	30	180
4 ".....		30	30													30	30	30	30	30	210
5 ".....		30	30													30	30	30	30	30	240
6 ".....		30	30													30	30	30	30	30	270
7 ".....		30	30													30	30	30	30	30	300
8 ".....		30	30													30	30	30	30	30	330
9 ".....		30	30													30	30	30	30	30	360
10 ".....		30	30													30	30	30	30	30	420



to give our track men data to facilitate their work in running off the elevation on to the tangents, and at the same time prevent unduly long run-offs; also to relieve the sudden jar on each end of a run-off when the same is made by a uniform grade.

A. MORRISON,
Engineer Maintenance of Way.

Relief of the Elevated Roads.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Your editorial of Jan. 2 intimates that some student of the subject may be able to suggest methods of relief. Many patrons of the road, who are not "students," have a certain amount of "study" forced upon them daily. Their views of possible betterments certainly have one element of the practical about them: they are gathered directly "on the ground."

You state that longer trains are probably impracticable, because requiring heavier engines and structures, and longer platforms. With the hurried mode of embarking required on the elevated roads, but few would embark at the ends of the longer trains and platforms, and the gain would not be in proportion to the increase of train length and of expenses.

You also intimate that greater room for increasing the train service would be difficult to secure.

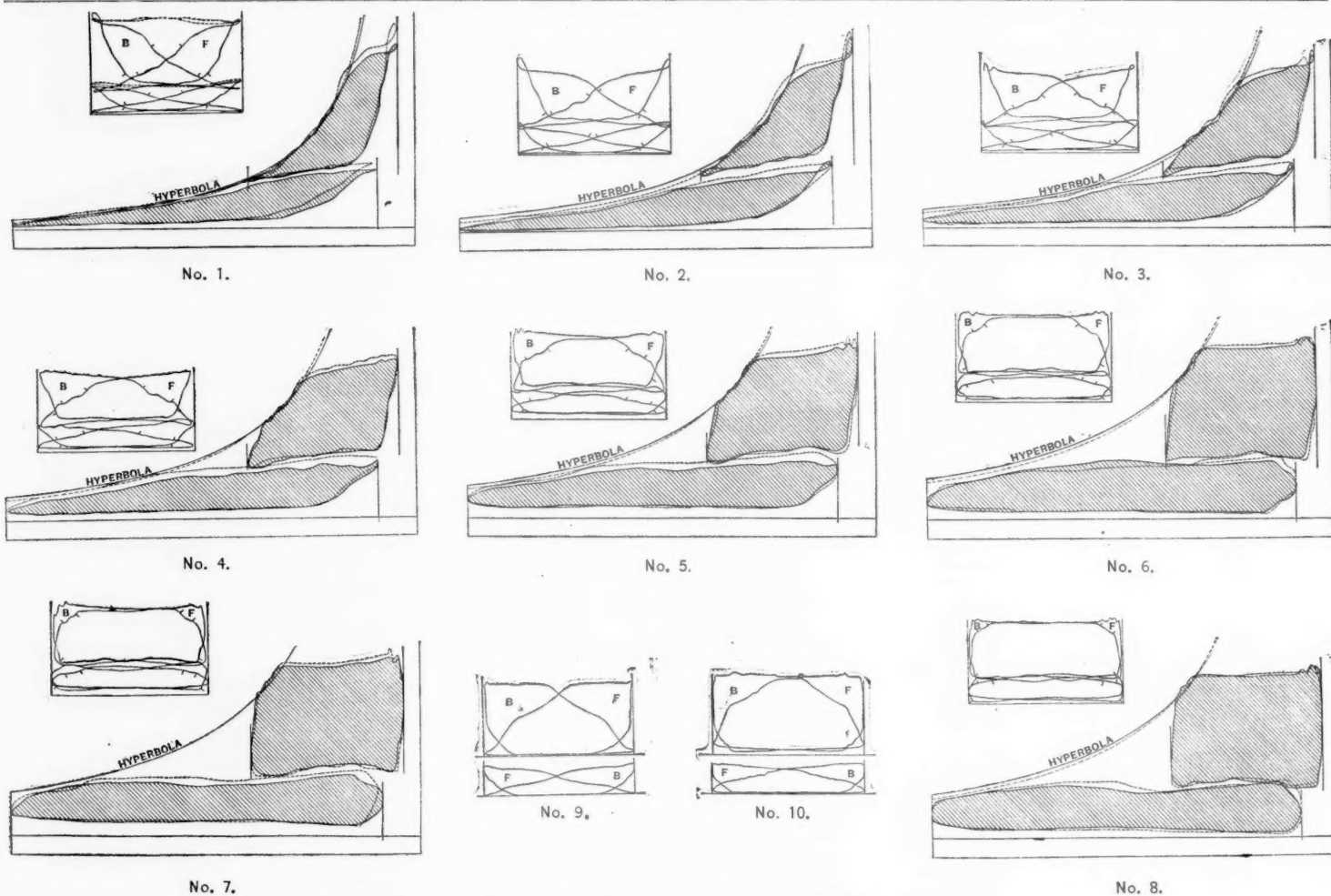
Therefore, the elevated roads must with substantially their present plant and appliances aim to increase their traveling capacity, and this is their most profitable way of doing so, if it can be done. To accomplish this the small economies of time must be looked into carefully. The carrying capacity of trains is now limited, of course, by the time consumed while in motion and the time consumed while at the station. The former cannot

feeling curious to know what his thoughts were when he glanced at your record of train accidents for November.

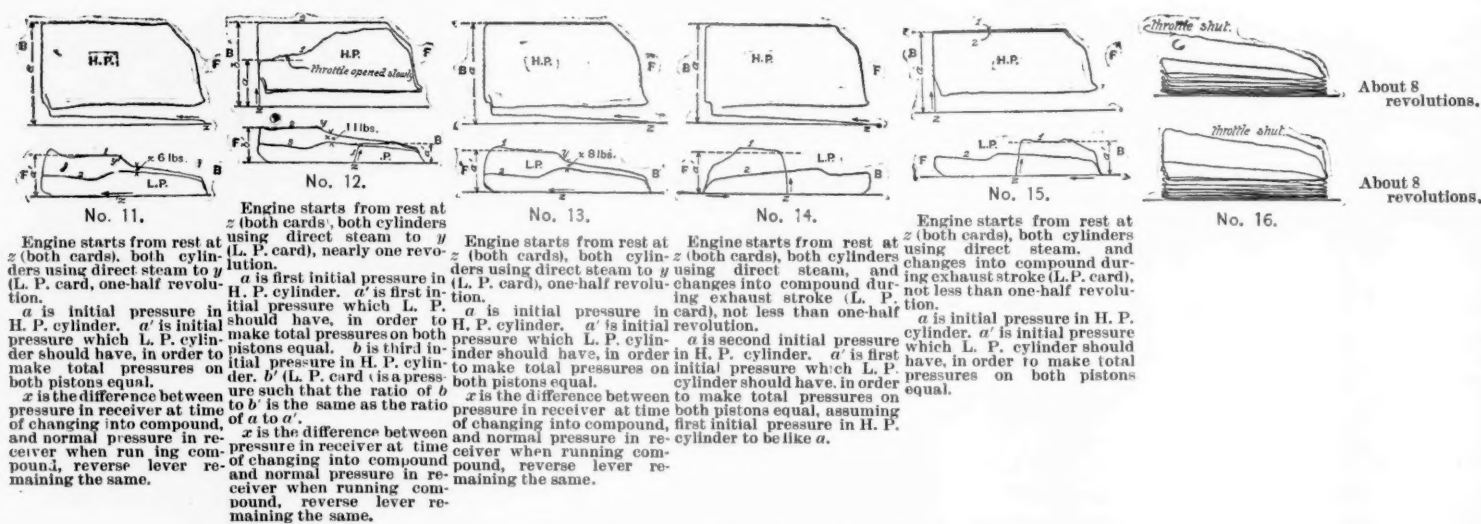
We must all rejoice at his having escaped death or injury during his course of reckless railroad riding, as described by him; yet that many are not so fortunate is strikingly shown by the statistics of 331 killed and injured in the November experiences, which you classify as accidents, although they should rather be termed results of our way of doing things.

And while we rejoice at Mr. Acworth's survival, we must feel some regret that he did not meet with one of the minor experiences so familiar to the American on his native heath, in order that his impressions might have been more from the outside than from the inside, as it were—partaking of a sympathy with the passenger rather than being concerned only for the economy of the investor. But he will be quite sure to encounter some of these healthy illustrations of what we do regularly accomplish by our savings, which result from not using safety appliances, if he keeps on our railroads only a reasonable length of time.

It is known to Americans, although it may not have occurred to an Englishman, that the citizens of considerable towns through whose streets the trains are run at 63 miles an hour are not satisfied that their rights are sufficiently considered; and they believe that they are entitled to the use of their streets in America as people are abroad, who enjoy the precious boon of safety through the construction of crossings which cost \$11,000. In your list for November you do not include the persons killed or maimed at the railroad crossings, and the losses and savings on this account cannot be discussed for want of a basis; yet we can do some heartrending



INDICATOR CARDS OF SIMPLE AND COMPOUND ENGINES. (See Table C.)



INDICATOR CARDS OF SIMPLE AND COMPOUND ENGINES.

similarity in appearance between an illuminated blade and a semaphore day signal, one must also have the pole or part of it illuminated. The laws of perspective will alter the seeming position of all but vertical lines.

Looking at illuminated blades from a mechanical standpoint, it would seem that they present too much ridge for the lodgment of snow. One blade in particular presents a veritable spoon to receive the falling snow when in the "off" position, as shown in the diagram. The weight of snow would tend to balance the signal arm to the "off" position, and that is a dangerous feature in case of the failure of operating connections.

The most arrestive feature of an illuminated blade is its color. The distinctness with which color is seen varies in direct ratio with the intensity of light, and the lens is the best known means for concentrating light. It has been alleged that there is a danger of the red glass falling entirely out of the blade and thus wrongly showing a white light. We have no record of any accidents due to this cause, except in one case, and there an illuminated blade was used. The falling out of the red glass in that case was no doubt owing to faulty construction. The illuminated blade showed white in the horizontal position, and the engineman took the white light as an all clear signal. In conclusion, I earnestly beg to draw the attention of our railroad officers and signal engineers to the superiority of the Stevens & Saxby signal lamps. Most of these lamps are made of copper,

and are consequently durable but expensive. We might embody in our lamps the good principles of construction and use a cheaper material.

ARTHUR H. JOHNSON,
Signal Engineer.

Comparative Study of Simple and Compound Locomotives.

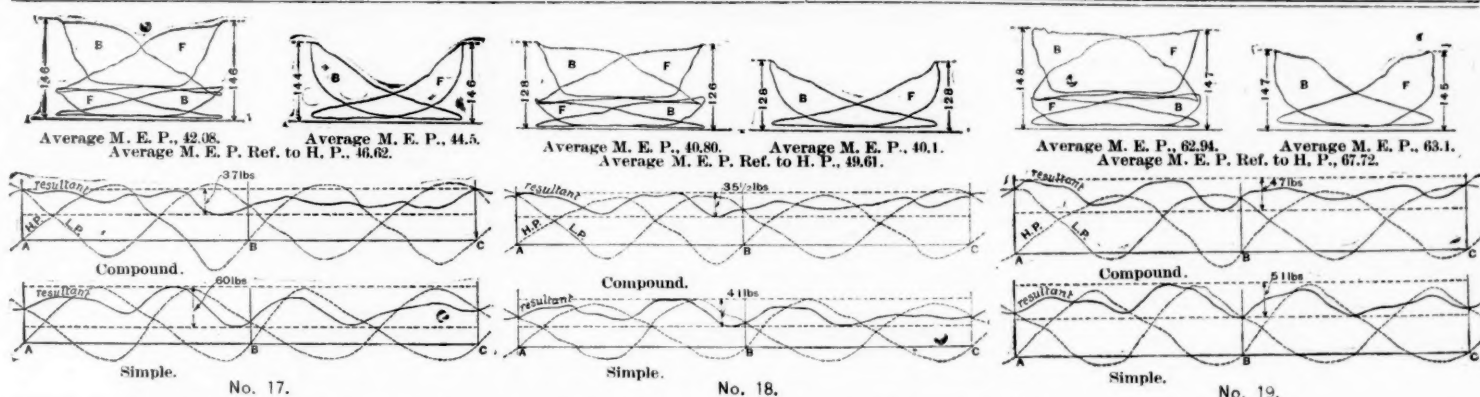
The Rhode Island Locomotive Works have just completed a very interesting series of experiments undertaken to show the comparative efficiency of two locomotives for elevated railroad service, one of the compound and the other of a simple type of engine. The engines are identical and of the Forney type, the general construction of which our readers are already familiar with. The general description of the engines and of the service in which they are used and a table of dimensions follow.

DIMENSIONS.		
Type.....	Compound.	Simple.
Fuel.....	Anthracite coal.	Anthracite coal.
Cylinder, size, R. S.....	18 x 16 in.	11 x 16 in.
" " " " L. S.....	11 1/4 x 16 in.	11 x 16 in.
" " ports, steam, R. S.....	1 x 17 in.	3/4 x 8 1/4 in.
" " " " L. S.....	3/4 x 10 in.	3/4 x 8 1/4 in.
" " exhaust, R. S.....	2 x 17 in.	1 3/4 x 8 1/4 in.
" " " " L. S.....	2 x 10 in.	1 3/4 x 8 1/4 in.
" " clearance, R. S.....	10.2 per cent.	8 per cent.
" " " " L. S.....	11 per cent.	8 per cent.
Steam pipe from boiler, R. S.....	2 in. dia.	3 in. dia.
" " " " L. S.....	3 1/2 in. dia.	3 in. dia.
Piston rod diameter.....	2 in.	2 in.

Type.....	Compound.	Simple.
Drivers, diameter.....	42 in.	42 in.
" " " " revolutions per mile.....	480	480
Boiler, diameter.....	42 in.	42 in.
" " flues, O. D.....	1 1/4 in.	1 1/4 in.
" " " " number.....	124	124
" " " " length.....	68 7-16 in.	68 7-16 in.
Exhaust tip diameter.....	3 in.	3 1/4 in.
Grate, style.....	Water grate.	Water grate.
" " size.....	54 1/2 x 41 in.	54 1/2 x 41 in.
" " area.....	15.6 sq. ft.	15.6 sq. ft.
Heating surface.....	280.46 sq. ft.	280.46 sq. ft.
" " " " fire box.....	45.46 " "	45.46 " "
" " " " flues.....	244. " "	244. " "
Area ratio, heating surface to grate.....	18.5	18.5
Steam chest valve, style.....	Balanced.	Balanced.
" " " " full travel.....	5 in.	4 in.
" " " " lap outside.....	h. p., 7/8; l. p., 1 in.	9/16 in.
" " " " clearance.....	h. p., 3/8; l. p., none	1-32 in. lap.
Weight, loaded.....	45,850 lbs.	45,350 lbs.
" " " " on drivers.....	31,534 " "	31,084 " "
" " " " on truck.....	14,316 " "	14,316 " "

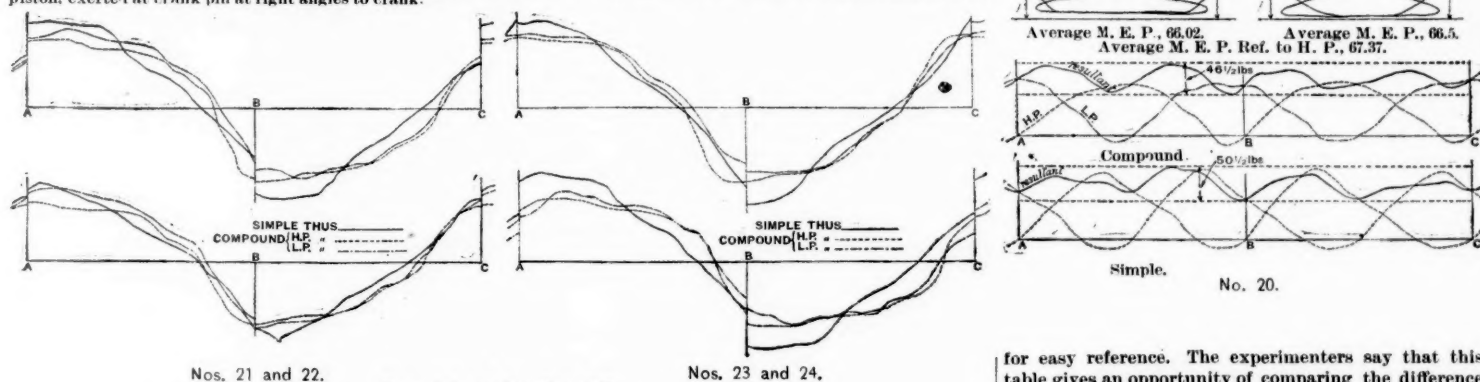
The compound engine is of the two-cylinder type, connected by a copper receiver. The cylinders were designed to do the average work with the best economy as nearly as could be predetermined. A device is provided allowing the engine to run as a simple engine, and the steam pressure for the low-pressure cylinder is reduced until the pressures per square inch in the cylinders are inversely proportional to the areas of the pistons. When the exhaust from the small cylinder has filled the receiver, direct steam is cut off from the large cylinder, and the engine works compound.

The service which these engines perform is rather se-



ROTATIVE EFFECTS ON SIMPLE AND COMPOUND ENGINES FROM ACTUAL CARDS OF SIMILAR INITIAL STEAM PRESSURES AND MEAN EFFECTIVE PRESSURES.

On each diagram straight line *A B C* is the development of crank pin circle. *A* and *C* are at back dead point of left crank. *B* is at forward dead point of left crank. Heights above *A B C* represent rotative effects per square inch of H. P. piston, exerted at crank pin at right angles to crank.



CRANK-PIN STRESS ON SIMPLE AND COMPOUND ENGINES.

On each diagram straight line *A B C* is the development of crank pin circle. *A* and *C* are at the back dead point; *B* is at the forward dead point. Vertical distances from *A B C* represent total force acting on crank pin due to steam pressure per square inch of horse power piston. Distances above *A B C* correspond to pulls of the connecting rod. Distances below *A B C* correspond to thrusts of the connecting rod.

for easy reference. The experimenters say that this table gives an opportunity of comparing the difference in cylinder economy between high and low pressure steam under similar conditions, and further state that it shows the water consumption to vary but little as the speeds vary under like pressures of steam at the same cut-off.

TABLE A.
Indicator Card Results.

Card No.	Initial Pressure.	Rev's per minute.	Notch and cut-off.	Horse power.		H. P. ratio L. P. to H. P.	Water per H. P. per hour accounted for by indicator, in pounds.				Remarks.
				H. P.	L. P.		H. P. Cut-off.	H. P. Release.	L. P. Cut-off.	L. P. Release.	
11	146	192	Notch No. 1, H. P. { E., 37 L. P. { E., 40	53.43	68.69	1.30	14.97	16.07	15.46	16.75	Experimental Cards.
10	146	258	Notch No. 1, H. P. { E., 37 L. P. { E., 40	66.78	79.33	1.19	16.19	16.49	15.49	18.54	
47	133	246	Notch No. 1, H. P. { E., 45 L. P. { E., 45	72.45	90.18	1.24	17.28	17.77	16.81	18.24	Simple.
48	133	246	Notch No. 1, H. P. { E., 45 L. P. { E., 45	75.56	89.37	1.17	18.46	18.61	16.13	17.65	
51	140	270	Notch No. 1, H. P. { E., 45 L. P. { E., 45	63.62	74.21	1.17	19.82	19.65	17.09	19.98	Simple.
52	140	270	Notch No. 1, H. P. { E., 45 L. P. { E., 45	84.57	106.3	1.26	17.88	19.00	15.91	17.10	
45	128	300	Notch No. 1, H. P. { E., 45 L. P. { E., 45	81.41	103.4	1.27	18.96	19.02	18.39	18.37	Simple.
46	141	324	Notch No. 1, H. P. { E., 45 L. P. { E., 45	70.38	93.49	1.33	19.43	19.24	18.48	18.44	
25	117	120	Notch No. 1, H. P. { E., 45 L. P. { E., 45	91.53	116.6	1.27	19.91	19.83	19.23	19.54	Simple.
3	119	228	Notch No. 2, H. P. { E., 53 L. P. { E., 53	76.87	61.21	0.80	18.98	18.95	17.94	18.22	
37	131	258	Notch No. 2, H. P. { E., 53 L. P. { E., 53	78.07	94.93	1.22	19.52	19.22	18.20	18.51	Simple.
38	142	258	Notch No. 2, H. P. { E., 53 L. P. { E., 53	94.90	113.6	1.20	19.09	19.15	18.04	17.86	
9	141	282	Notch No. 2, H. P. { E., 53 L. P. { E., 53	95.38	116.1	1.22	19.73	20.25	18.39	18.88	Simple.
4	119	300	Notch No. 2, H. P. { E., 53 L. P. { E., 53	110.7	131.7	1.19	18.82	18.50	17.64	18.40	
10	131	318	Notch No. 2, H. P. { E., 53 L. P. { E., 53	106.9	125.4	1.17	19.29	19.42	17.62	18.67	Simple.
35	135	330	Notch No. 2, H. P. { E., 53 L. P. { E., 53	93.51	114.1	1.22	20.51	20.29	19.89	20.25	
19	149	180	Notch No. 3, H. P. { E., 62 L. P. { E., 62	107.1	109.2	1.02	19.31	19.45	17.79	18.05	Simple.
20	147	224	Notch No. 3, H. P. { E., 62 L. P. { E., 62	123.6	133.0	1.08	19.86	20.00	18.37	18.69	
11	138	276	Notch No. 3, H. P. { E., 62 L. P. { E., 62	127.1	142.1	1.12	21.03	21.06	19.94	20.39	Simple.
34	134	282	Notch No. 3, H. P. { E., 62 L. P. { E., 62	125.9	148.5	1.18	20.48	20.14	19.70	19.63	
12	130	306	Notch No. 3, H. P. { E., 62 L. P. { E., 62	127.6	140.5	1.10	21.84	22.04	19.40	20.79	Simple.
42	127	150	Notch No. 3, H. P. { E., 62 L. P. { E., 62	119.2	93.74	0.79					
15	124	210	Notch No. 4, H. P. { E., 73 L. P. { E., 73	107.6	108.1	1.005	22.37	22.10	19.88	21.56	Simple.
43	120	228	Notch No. 4, H. P. { E., 73 L. P. { E., 73	108.5	116.3	1.07	22.23	21.96	21.19	21.96	
44	129	252	Notch No. 4, H. P. { E., 73 L. P. { E., 73	130.1	133.7	1.03	20.70	22.02	21.45	21.61	Simple.
21	141	270	Notch No. 4, H. P. { E., 73 L. P. { E., 73	149.6	152.7	1.02	22.51	22.44	21.28	21.86	
31	134	168	Notch No. 5, H. P. { E., 77 L. P. { E., 77	104.4	118.0	1.13	20.86	20.79	20.91	20.80	Simple.
32	145	210	Notch No. 5, H. P. { E., 77 L. P. { E., 77	138.2	137.8	0.997	22.21	22.09	21.42	21.22	
23	128	264	Notch No. 5, H. P. { E., 77 L. P. { E., 77	143.9	142.5	0.99	24.40	24.38	24.57	23.97	Simple.
1	136	100	Notch No. 6, H. P. { E., 81 L. P. { E., 81	74.07	63.77	0.93	22.50	22.75	20.97	21.01	
17	143	192	Notch No. 6, H. P. { E., 81 L. P. { E., 81	134.0	132.6	0.99	22.87	22.73	22.53	23.23	Simple.
33	148	222	Notch No. 6, H. P. { E., 81 L. P. { E., 81	150.9	155.8	1.03	22.30	23.27	23.16	22.60	
32	144	270	Notch No. 6, H. P. { E., 81 L. P. { E., 81	175.0	165.6	0.95	25.66	25.48	25.29	25.12	Simple.
27	136	180	Notch No. 7, H. P. { E., 84 L. P. { E., 84	122.0	114.1	0.94	24.98	24.68	24.22	24.47	
28	134	216	Notch No. 7, H. P. { E., 84 L. P. { E., 84	138.6	122.9	0.89	26.73	26.43	26.08	25.79	

line of hyperbolic expansion by a full line, and the expansion of saturated dry steam by a dotted line. Cards 1 to 8, inclusive, have a common atmospheric line. Cards 9 and 10 were taken with the engine working on the simple system. The speed at which these cards were taken is greater than will be required for the engine to work as the simple engine, as it is intended only to be used in that way while starting trains at slow speeds. These cards show considerable wire drawing owing to the small size of admission pipe for such speeds.

Cards 11 to 15, inclusive, were taken while the engine was starting from rest. Cards 14 and 15 show the action of the reducing valve in holding the equality of the total admission pressure on the two pistons. Cards 11 to 13 show this as well, and also the time of automatic action in changing to the compound system, and the difference in pressure in the receiver at the time of change and for one revolution thereafter.

Card 16 shows the number of revolutions made by the compound after the throttle was shut before the passages were freed from steam pressure, when the reverse lever was in the last notch. This is a disadvantage in yard work and is obviated in this engine by the device which allows the engine to be used simple.

The table A contains results from 33 cards tabulated

The water consumption in this table is figured from the indicator cards, and is said to have been verified by the results of actual service tests, in which 24 per cent. less water was used by the compound than by the simple engine in doing practically the same work for 14 hours.

Diagrams 17 to 20, inclusive, show the rotative effect on each crank pin, together with the resultant effect for one revolution. The data taken for the simple locomotive for use in those diagrams are from actual cards from locomotives. Those from the compound are taken from the engine here described, the mean effective pressure and initial pressure being the same in both cases.

The following are quotations from the conclusions drawn by the builders:

TABLE B.
General Data of Tests.

No. of cars.	Car miles, No. 62 and 58.	Running time.		Coal used, lbs.		Water used, lbs.	
		No. 62.	No. 58.	No. 62.	No. 58.	No. 62.	No. 58.
4	24	35 min.	30 min.	1,190	1,445	560	471
4	20	24 min.	26 min.	.....	.....	3,062	1,914
4	20	25 min.	26 min.	.....	.....	2,842	1,973
4	20	22½ min.	25 min.	.....	.....	500	2,227
4	15	22 min.	24 min.	.....	.....	1,811	1,428
4	10	23½ min.	23½ min.	.....	.....	1,693	1,296
4	10	23½ min.	23½ min.	.....	.....	1,818	1,428
4	10	24 min.	23 min.	500	.....	1,767	1,502
4	10	24 min.	24 min.	500	.....	1,870	1,502
4	10	23½ min.	24 min.	500	.....	2,069	1,530
4	15	26½ min.	25 min.	.....	.....	2,812	1,944
4	20	25 min.	24 min.	133	.....	2,768	1,399
4	20	24 min.	24 min.	68	.....	721	1,178
4	20	29 min.	34 min.	.....	.....	.....	.....
3	15	23½ min.	23 min.	.....	.....	.....	.....
4	24	36½ min.	29 min.	.....	.....	.....	.....
353	.....	.....	.....	3,899	2,430	26,070	19,862

RESULTS.

Gain in fuel over No. 62, average for day, 37.7 per cent.
Average coal per car mile for day, No. 62, 11.05 lbs.
Average coal per car mile for day, No. 58, 6.88 lbs.
Gain in water over No. 62, average for day, 23.8 per cent.
Gain in water over No. 62, average for three and four car trips, 23.1 per cent.
Gain in water over No. 62, average for two car trips, 20.9 per cent.
Equivalent at 58° of water evaporated in No. 58 at 47°, 20,049 lbs.
Equivalent evaporation from and at 212°, No. 62, 8.09 lbs.
Equivalent evaporation from and at 212°, No. 58, 9.97 lbs.
Water evaporated at 58° per pound fuel in No. 62, at 140 lbs. pressure, 6.69 lbs.
Water evaporated at 58° per pound fuel in No. 58, at 135 lbs. pressure, 8.25 lbs.
Average water per car mile for day, No. 62, 73.85 lbs.
Average water per car mile for day, No. 58, 56.27 lbs.
Average water per car mile for three and four car trips, No. 62, 65.06 lbs.
Average water per car mile for three and four car trips, No. 58, 48.11 lbs.
Average water per car mile for two car trips, No. 62, 89.89 lbs.
Average water per car mile for two car trips, No. 58, 71.14 lbs.

"A reference to table B shows a decided saving in fuel and water consumption under the conditions of a 14-hour test heretofore described. This would be anticipated from diagram results in table A. Aside from the first cost and labor of handling this saving affects the time lost by the engines in coaling and taking water. The latter is of evident value on limited trains. In the elevated service it enables in many cases an engine which reaches the terminal late to save the time that would otherwise be used in taking water, thereby preventing the following train from being held by a signal. This was a fact noticed and commented upon by the train dispatcher at the terminal where water and coal were taken.

"The capabilities of the compound to equal the simple engines in making short runs on quick time were fully demonstrated. This compound, by reason of its ability to be run at will as a simple engine, can equal the maximum power of a simple engine, when the small cylinder on the compound equals in size each of those on the simple, and the steam pressures are alike.

"The smoothness of running on the compound as compared with the simple is noticeable in riding on the engines. This is explained by a comparison of the resultant rotative effects on the crank pins for the different systems, as illustrated graphically, with data, in figs. 17 to 20, inclusive. This is a very desirable result, as it affects the connections through the whole train.

"The crank pins and reciprocating parts are not subject to such high pressures or sudden variations in stress during each half stroke in the compound, a result greatly to be desired. A comparison of stresses on the two systems, with data, is graphically illustrated in figs. 21 to 24, inclusive.

"Cylinder oil can be used with the best economy in the compound engine, the oil fed to one cylinder passing through both.

"The cleanliness of the compound from cinders and sparks is a strong point in its favor. Its comparative stillness is also another desirable factor under certain conditions of service."

Wrecking Outfits and Handling Wrecks.*

BY P. W. HYNES.

IV.—THE TOOL CAR.

As I have already stated, there should be nothing in the tool car, with the exception of ropes, chains and jacks, which an ordinary man cannot easily carry. Nor should there be any of the antiquated, cumbersome apparatus which has outlived its usefulness, as all the space of floor, sides and roof will be required for the accommodation of the simple, light, durable appliances which should go to make up the well-ordered outfit of to-day. I wish I could say that this practice is the rule, but I know that the reverse is true. The fact is that the whole question of wrecking has been slighted to such a degree that the want of uniformity is quite as marked on the various divisions of a single road as it is between the different roads.

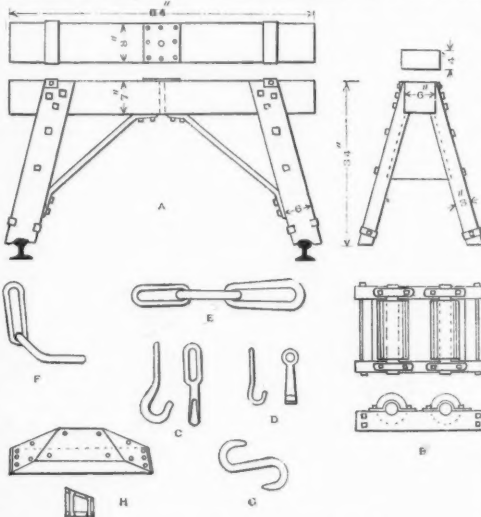
Now, while different kinds of country may require distinct features in the wrecking tool car, there is no reason why such parts of the outfits as are common to all should not be uniform, and the advantages accruing are too obvious for mention. Thus a flat, marshy district would probably call for a quantity of wire rope which would answer better than hemp rope to attach the tackles to the "deadmen" sunk at a distance over wet ground. But there is no reason why the blocks and jacks in such a place should not be precisely similar to those used in a mountainous district.

The most expensive plant is not necessarily the best, and there is no need of excessive cost in order to provide a satisfactory equipment. But it is necessary that the question should be carefully studied out and that the tools provided should be of the kind needed and the best of the kind that can be had.

It is better to err on the side of liberality, but this is so seldom done that no caution is required.

To illustrate my views, perhaps I cannot do better than to describe an outfit of wrecking tools which I have used for several years with the greatest satisfaction.

The car is fitted with end platforms and end and side doors. A passageway 2 ft. wide extends from one end door to the other, and the space between the side doors is also kept clear. One-half of the car is devoted



Useful Articles for a Wrecking Outfit.

to the ropes, which are coiled down on platforms about 4 in. above the floor on each side of the passageway, the platforms being made of strips 1 in. thick, placed a few inches apart to allow for circulation of air. On the sides of the car over the ropes are arranged on hooks the blocks, shackles, etc., together with the bars. The passage at the other end of the car is defined by posts running up to the roof. Inside these posts are piled the pieces of blocking, excepting for a few feet at the end on each side, where space is reserved for jacks. On either side of each side door is a shallow box for chains, while under the centre of the car is a cellar for iron tools. Over the jacks are kept tail bolts, centre pins and wedges, and the roof space is occupied by a lot of shovels. I wish merely to give some idea of the general arrangement, the details of which are of little importance so long as it is remembered that the tools should all be classified and kept separate, those oftenest required having the most accessible positions. System is the main point, and a tool car should be so arranged that a man familiar with it could lay his hand upon any desired tool without disturbing the others. The requirements of the service will have the strongest influence in forming the character of an outfit, but the man in charge will always show his hand in the selection of tools, as well as in their condition and arrangement. Simplicity, uniformity, strength, lightness, these are the qualities at which all should aim. Nor is there any advantage in a great variety; it oftenest leads to confusion, and each tool should answer as many purposes as possible, with due regard to its simplicity and adaptability.

The blocks in this outfit have already been minutely described. Of ropes I use only three sizes, 1 in., 1½ in.

*Copyright, 1890, by P. W. Hynes.

and 3 in. in diameter. The smallest is used in lashings, light tackles, etc., the 1½ in. for hauling lines, and the 3 in. for switch ropes and also for very heavy work when rove in gin blocks. There are hydraulic jacks, both crown and toe lift, also ratchet-traversing jacks and bottle jacks, with appropriate fittings for each. There is the usual assortment of tools and appliances, such as chains, shackles, three-link couplings, timber dogs, car-frogs, car replacers, wedges, blocking, oil and waste, buckets, cans, bolts and nuts, spare parts of blocks, track tools, canvas sacks and scoops for grain, centre pins, tail bolts, etc., a list which will vary for different localities.

Now as to blocking a word will not be amiss. It is a common practice to carry a quantity of pieces of wood of all kinds and sizes, and this would seem to be the better plan at the first glance; but experience proves the reverse. Uniformity is as essential here as elsewhere. Let the blocking be of uniform width and thickness; made of seasoned pine, they will be light to carry, and can be easily and quickly placed so as to sustain anything on wheels. Pine car sills, taken from cars undergoing repairs, cut to about 30 in. in length, answer excellently. These can be easily piled in the car so as to waste no room. Sometimes the blocking is carried on a flat car attached to the tool car, but it is better to keep it in the shelter of the tool car.

I append a sketch showing a few special tools which will be found very useful. Particulars of their use will be given later, but at present I will merely refer to it generally. A is called a "horse and saddle," and is used to balance a car while trucks are being placed under it. It is carried on the derrick car. B is a double dolly; C a hauling hook for attaching the hauling part of a tackle to the drawhead of an engine, etc. D attaches a hand or watch tackle to the rail. E is a three-link coupling for attaching purchase to a derailed engine; it is of 1½-in. iron. F is a double link with one bent member, and G is an S-hook. H is a car replacer for use with an ordinary car frog.

Lentz's Stayless Locomotive Boiler.

During the past two years considerable attention has been paid to the introduction of a corrugated furnace in locomotive construction. So far, this change in construction can only be considered as an experiment, but it is one of those experiments which may result in a decided improvement, and therefore it is watched with much interest. In a recent letter to *Engineering*, Mr. Gustave Lentz, late Managing Director of the Hohenzollern Locomotive Works, Germany, describes designs which he has made of corrugated furnaces for locomotive boilers. He says:

"During the last 60 years the locomotive engine has been considerably improved in most parts of it, but the boiler still retains the form Robert Stephenson gave it. It has in its designs many disadvantageous features, and usually requires a great amount of repairs. The stiffening of all flat plates is very complicated, and makes the designing of the boiler more and more difficult, as the steam pressure is always increasing, and now, with the compound engines coming into favor, it is a necessity to have a higher pressure or the profits from reduced coal consumption will be too small to compensate for the complications requiring attention, especially when the engines are getting old."

His reasons for stronger locomotive boilers are good, but he is hardly right in saying that the boiler is now in the form which Robert Stephenson gave it. The changes within the last ten years have been sufficient to make the modern locomotive boiler a new and distinct type.

The boilers designed by Mr. Lentz consist of two truncated cones, with a cylindrical part in the middle and an inside fire box of corrugated flues so arranged that the ends of the boiler are of smaller diameter than the middle portion. The top is inclined from the middle toward the ends, the steam space being thereby located approximately in the centre of the boiler lengthwise. As the tubes are sufficient to stay the tube plates, no further stay seems to be necessary. The fire box itself is divided into two nearly equal parts by a fire bridge which has an opening of a half circle. The gases from the fuel here mix with hot air and are consumed in the combustion chamber beyond the arch. It is supposed that the reduced speed of the gases after passing the fire bridge opening will permit of cinders and ashes dropping in the ash pit at the bottom of the combustion chamber.

The air for combustion for gases above the fire enters the fire box partly through the fire door casting and partly through the lower part of the fire bridge, so that from above and below hot air is entering and mixing with the gases. At the rear end of the boiler is placed a small dome for the boiler fittings. With this type of boiler there is not much obstruction in the space between the frames.

One of the designs by Mr. Lentz, figs. 1, 2 and 3, has the following general dimensions:

Diameter of cylinders	.....17 in.
Piston stroke	.....26 in.
Diameter of driving wheels	.....6 ft. 7 in.
" " leading	.....3 ft. 6 in.
Adhesive weight of engine	.....28½ tons (2,240 lbs.)
Total weight of engine loaded	.....43 tons (2,240 lbs.)
" " boiler empty	.....38½ tons (2,240 lbs.)
Distance between centres of cylinders	.....1 ft. 11 in.
Heating surface of fire box and combustion chamber	.....109 sq. ft.
Heating surface of tubes	.....1,08 sq. ft.
Total heating surface	.....1,117 sq. ft.

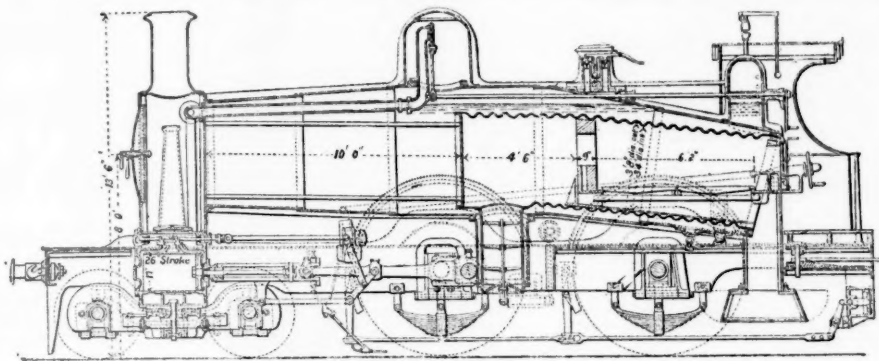


Fig. 1.

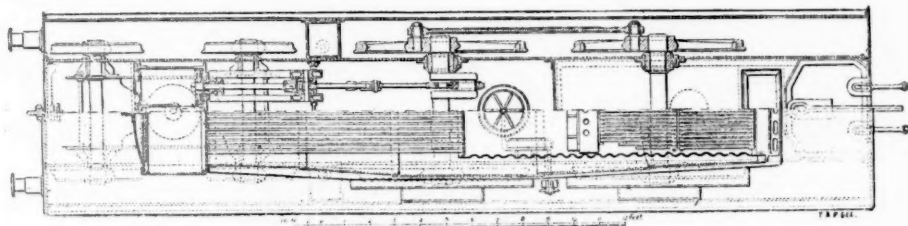


Fig. 2.

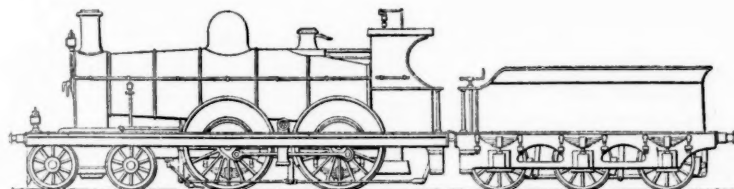


Fig. 3.

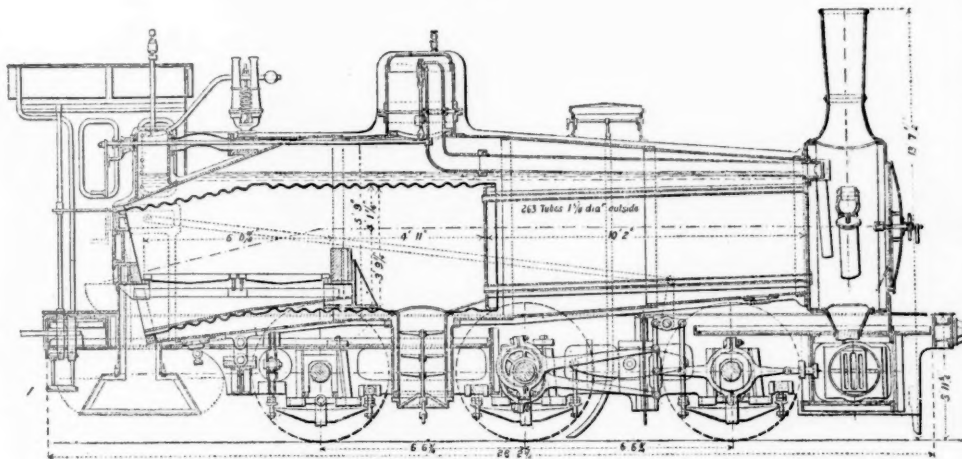


Fig. 4.

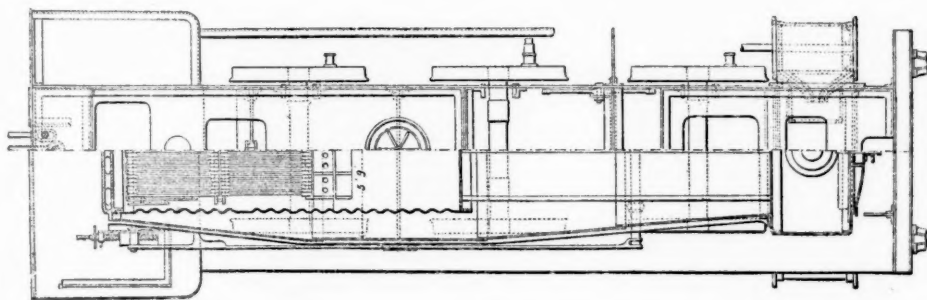


Fig. 5.

LENTZ'S STAYLESS LOCOMOTIVE BOILERS.

Tubes, outside diameter.....1 1/4 in.
Tubes, number of.....218
Tubes, space between.....5 1/2 in.
Length between tube plates.....10 ft.
Area of fire grate.....17 1/2 sq. ft.
Contents of one cylinder.....5,901 cu. in.
Proportion of contents of cylinder in cubic inches to heating surface in square feet.....1 to 0.189
Proportion of direct to indirect heating surface.....1 to 9.25
Proportion of grate surface to heating surface.....1 to 60.4
Proportion of outside tube diameter to length between tube plates.....1 to 68.6
Proportion of centres of cylinders to wheel base.....1 to 9.91
Proportion of piston stroke to driving wheel diameter.....1 to 3.04
Steam pressure per square inch.....220 lbs.

Another design is a German six-wheel, coupled outside cylinder, freight engine as now built for the Prussian Government, figs. 4 and 5. This design was somewhat hampered by the Prussian standard dimensions, and a comparison of Mr. Lentz's design with the standard

Prussian goods engine will be found in the following list of dimensions:

	Prussian goods engine.	Mr. Lentz's engine.
Diameter of cylinders.....	17 3/4 in.	17 3/4 in.
Piston stroke.....	24 1/2 in.	24 1/2 in.
Diameter of wheels.....	4 ft. 4 3/4 in.	4 ft. 4 3/4 in.
Total weight of engine loaded.....	t. c. q. 37 17 3	t. c. q. 40 0 0
empty.....	32 11 2	32 12 2
Distance between centres of cylinders.....	6 ft. 8 in.	6 ft. 8 in.
Total wheel base.....	11 ft. 8 in.	13 ft. 1 3/4 in.
Heating surface of fire box and combustion chamber.....	84 sq. ft.	125 sq. ft.
Heating surface of tubes.....	1,436 "	1,267 "
Total heating surface.....	1,510 "	1,392 "
Tubes, outside diameter.....	1 1/4 in.	1 1/4 in.
number of.....	186	203
space between.....	5 1/2 in.	5 1/2 in.
Length between tube plates.....	14 ft. 10 3/4 in.	10 ft. 2 in.
Area of fire grate.....	16 1/2 sq. ft.	20 1/2 sq. ft.

	Prussian goods engine.	Mr. Lentz's engine.
Contents of one cylinder.....	6,115 c. in.	6,115 c. in.
Proportion of contents of cylinder in c. in. to heating surface.....	1:0.247	1:0.227
Proportion of direct to indirect heating surface.....	1:18	1:11.1
Proportion of grate surface to heating surface.....	1:91.5	1:67.9
Proportion of outside tube diameter to length between tube plates.....	1:90.5	1:67.4
Proportion of centres of cylinders to wheel base.....	1:1.67	1:1.97
Proportion of piston stroke to driving wheel diameter.....	1:2.11	1:2.11
Steam pressure per square inch.....	112 lbs.	170 lbs.

The letter given in *Engineering* also contains information relative to the value of this style of fire box for stationary boilers. In speaking of the Strong engine, Mr. Lentz states:

"Mr. Strong is the only one who has practically dispensed with the complicated fire box, but still his boiler has a very complicated part in the connection of the three barrels. He proved that the corrugated tube could be advantageously used for an inside fire box of a locomotive boiler, but his scheme throws the boiler very high up and requires an engine which is specially designed for this boiler. It could never be used for replacing an old boiler."

The Use of Oil.

The amount spent for lubricating material on cars and engines, though not one of the largest expenses in railroad operating, yet aggregates a considerable sum in the course of the year. The relative cost to the total operating expense for the oil supply may be roughly estimated at one per cent., though varying considerably on different roads. The causes of this variation are numerous, but may be grouped into two classes which can be called, for want of better terms, the "natural" and "artificial" causes.

Under the causes which we may call natural are the various conditions of traffic, involving to some extent the character of the loading of the cars and the speed of trains; the character of country passed through, whether sandy or not, and the material used for ballast. The other causes for the variation of cost are the relative prices paid for the oils, and the manner, economical or otherwise, in which they are used. Of two roads using the same grade of oil, that on which the use is most carefully looked after will show the lowest relative cost; while if oils of different prices are used, the road upon which the highest priced oil is used will, of course, show the highest relative cost on the basis of an equal consumption.

There is also the element to be considered of the extra work one oil will do, as compared with another, on account of its better wearing qualities. We often hear the claim made by those handling some special oil that their goods will give enough longer service to more than balance the difference in cost. To get this increased service is an important matter, and the extra element comes in of the cost of the necessary inspection and watching, in order to obtain the economy in use that a better article should show.

We have seen cases where, upon engines, a higher class of oil was called for than had been used, to obviate some difficulty with heating certain of the bearings. There was some perceptible difference in the line of freedom from heating, but the enginemen used about the same quantity of the special oil that they had done of the ordinary black oil formerly in use, with the result of much increasing the cost of lubricating material per mile run by engines. It, in fact, might be a question whether the best engine operation did not call for this course. The bearing and rubbing parts of engine machinery have to be continually supplied with oil which is mainly a supply from minute to minute, as there is not the chance to reuse the same oil over and over, which exists in the journal boxes of cars. In this use, therefore, the relative wearing qualities of different oils do not enter so largely, and it is undoubtedly often the best practice to use a fair average quality of a cheap oil than a higher priced one which, theoretically, should do a little better.

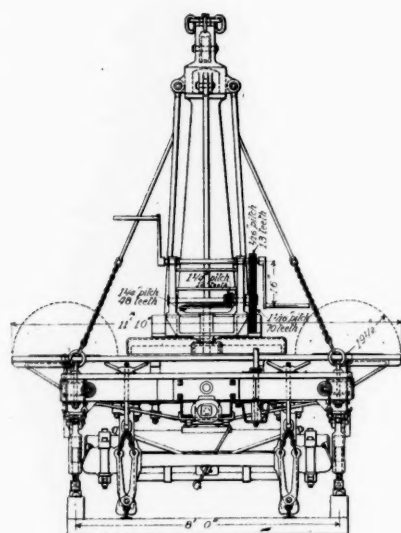
In the lubrication of car boxes there is a greater chance to make a saving by better inspection and more accurate fitting of the lids and dust guards. Experiments and records show that the men at one oiling station may use four times the amount of oil to the same number of boxes that is used at another point where the conditions are nearly similar.

Under such circumstances there is often an advantage in contracting the car oil supply from some dealer on a total cost guarantee. By this means he becomes financially interested in showing a good record, and his inspectors, having a direct interest in the matter, are more prompt in following up any wastage than the average car oiler, and a material saving in total cost may be made, even while using a somewhat higher priced material than formerly. X.

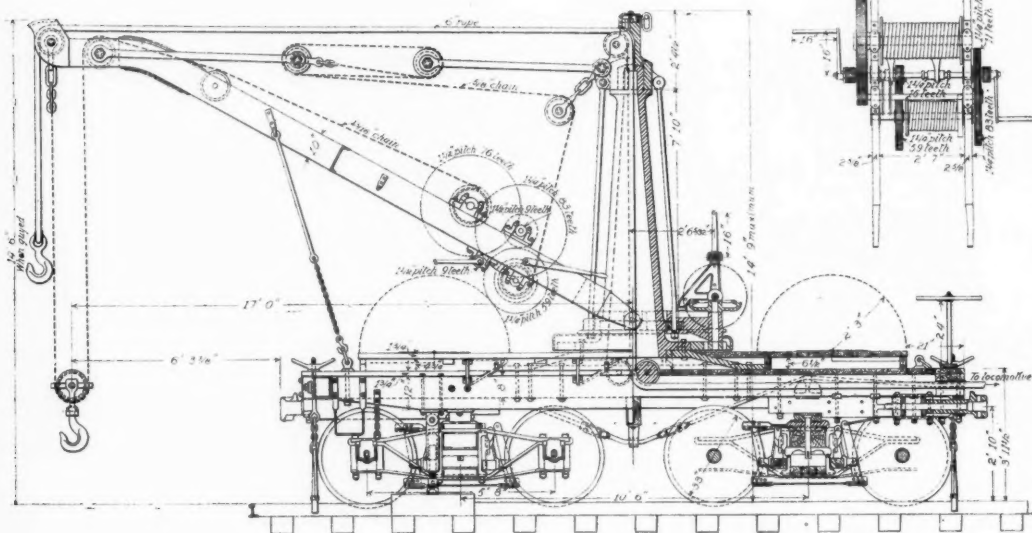
10-Ton Derrick Car—Baltimore & Ohio Railroad.

The design of derrick car shown is the standard of the Baltimore & Ohio for wrecking purposes. It is not claimed as an original design, but has been carefully remodeled and strengthened in several details, and has some novel features. The capacity of the derrick is 10 tons, with a maximum fibre stress of 10,000 lbs. per square inch when the boom is at a radius of 17 ft.

It will be noticed that the under frame is almost en-

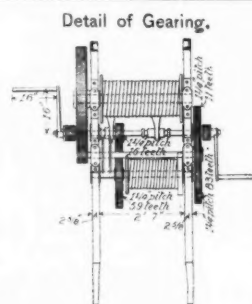


End Elevation.



Side Elevation.

TENTON DERRICK CAR—BALTIMORE & OHIO RAILROAD.



Cross Section Showing Body Bolster.

tirely of wood, the sills being eight in number; that is, two side, two centre, and four intermediate sills. The side sills are 12 in. deep \times 6 in. wide; the centre sills 8 in. \times 5 in. The car itself is rather a short one, being only 20 ft. over the end sills.

There are two truss rods beneath, as shown in the side elevation, with one strut each on a wooden transom passing under all sills, and rabbetted out for the side sills.

The boom is made of two 10-inch iron channels fastened together with lattice work and terminating in the lower end in a cast iron hinge and in the upper end in a cast iron head carrying the rope sheave. One of the novelties is a simple arrangement for raising and lowering the boom independent of the movement for raising and lowering the load. This is accomplished with the same set of gearing that is used for hoisting, by the addition of a chain drum. The boom is raised and lowered by shifting the crank to a central position, the hoisting gear being thrown out of use. The connection is made by sliding a loose pinion on the crank shaft into the teeth of the spur gear and securing it by a dog. The chain drum holding the load is held in any position by means of a ratchet and pawl.

Two speeds are provided, according to the weight to be raised. The hoisting gear can be thrown entirely out of use and the load lowered by means of the brake. The end gear shown at the back of the mast is used for revolving the boom and its load.

The boom stays, shown in the side and end elevations, pass from near the end of the boom to the corners of the car and serve to keep the boom in position when the car is being transported, and to prevent any part of the derrick car from exceeding the maximum allowable height to pass safely over the road. When these stays are hooked into the rings in the corners of the car, the boom is raised until the stays are taut. This is a necessary safety device on the road where the overhead room in tunnels is limited.

As usual, the car is provided with side jacks and rail clamps, as well as receptacles under the raised platforms to carry bars, ropes, pulleys, etc. Side boards are also provided which can be raised to the level of the floor of the car and give additional standing room when the car is not in use.

Buildings and Structures of American Railroads.*

BY WALTER G. BERG.

No. 11—ICE HOUSES.

The consumption of ice on railroads has reached such proportions that it has been found advantageous to build special ice houses, so as to allow the railroad company to have control of its ice supply and to be independent of local ice companies.

Relative to the quantity of ice used for various purposes, it is impossible to give data that will hold in all parts of the country. The following information can be taken as a fair average obtained from actual observation on one of the leading Eastern trunk lines. There are, generally, one or two coolers in every passenger car or Pullman coach, each cooler holding from 30 to 40 lbs.

of ice. This amount will last about 16 hours in summer and about 24 hours in winter, although, if the cars are kept well heated in winter, the ice will melt about as fast as it does in summer. Thus, with the knowledge of the number of regular trains running on a road, the approximate amount of ice required for the passenger service can be ascertained. Provision should be made, however, for irregular and summer excursion trains, which latter require fully twice as much ice as regular trains. The quantity of ice needed for station and office use is determined by the number of coolers. Small stations, on the road referred to above, receive 30 lbs. of ice daily in summer, while large stations receive from 75 to 125 lbs. The amount of ice required at shops varies according to the number of men employed. Probably from 200 lbs. to 1,000 lbs. daily during the summer months will answer, the latter amount being ample for the largest shop system. The data at hand relative to the ice capacity of refrigerator cars varies considerably. According to the kind of car used and the service expected of it, one charge will take from 1,000 to 4,100 lbs., which charge will last from 2½ or 3 days to a week. Ice melts faster in cars that are in motion than when they are standing.

When estimating the probable quantity of ice to be stored, due allowance should be made for shrinkage while in store. The loss of ice by shrinkage in the brick ice house of the Lehigh Valley Railroad at Mauch Chunk, Pa., is stated to be 10 per cent. in one year, and slightly more in the frame ice house of the same railroad at Phillipsburg, N. J. The shrinkage in a large house will be proportionately much less than in a small house, as the shrinkage is dependent on the exposed surface of the ice, which does not increase as fast as the cubical contents. Due regard should also be paid to the possibility of a short crop during one season, wherever the railroad company harvests its own ice supply.

The nominal capacity of an ice house is generally taken to mean the capacity up to the eaves. By stocking the ice higher up under the roof, working from the gable ends or doors cut in the roof, the capacity can be increased 10 per cent. or even more. The capacity of an ice house can be approximated by the following data: 34 cu. ft. of ice are equivalent to a ton of 2,000 lbs. (the ton generally referred to in railroad work), or 38½ cu. ft. of ice make a standard ton of 2,240 lbs. A very usual assumption is, however, that ice weighs 60 lbs. per cu. ft., which gives 33⅓ cu. ft. to a short ton and 37½ cu. ft. to a long ton. For practical purposes, in estimating the quantity of stored ice, it is correct to assume 36 cu. ft. per short ton or 40 cu. ft. per long ton, so as to make due allowance for the voids and irregular packing of the cakes. In comparing, however, the reported nominal capacities of different ice houses with their actual cubical contents, the result shows 40 cu. ft. per short ton and 45 cu. ft. per long ton. In some cases even larger variations are obtained, more particularly in very large ice houses, where the lost space seems to be proportionately larger than in smaller houses.

With very few exceptions, frame buildings are in general use for ice houses, which allows cheap structures to be built, in addition to the advantage that wood is a very good non-conductor of heat. The essential features that should be embodied in an ice house design to insure success, are non-heat conducting walls, the prevention of air penetrating the house from the sides and bottom, ample ventilation on top of the ice, good drainage at the bed, and proper appliances and arrangements for handling and stocking the ice economically.

To make the walls as non-conductive of heat as possible and to prevent the passage of air through them, an air space is introduced in the walls or a space filled with sawdust, shavings, ashes, or some non-heat conducting material. Layers of building paper or tarred felt are

also employed. A combination of several of these methods is usually the rule. Where an air space is used, proper provision must be made to keep the air pure by proper openings affording ventilation. Where the walls are filled in with sawdust or some similar material, it is very essential to prevent moisture, as far as possible, from penetrating the filling material, not only on account of the damaging effect of the filling in that condition on the life of the wood in contact with it, but also owing to the fact that the presence of water increases the heat-conducting qualities of the filling material. Suitable holes under the eaves of the building, connecting with the top of the spaces in the walls, should be introduced, so as to afford any moisture that may have penetrated the filling a chance to evaporate. A double roof is a very desirable construction, but, as a rule, the protection against heat penetrating through the roof of the building consists of planking the roof, rafters on top and bottom, creating an air space equal to the thickness of the rafters. The outside of the building should be painted some light color or whitewashed, as less heat of the sun will be thus absorbed. Doors and ventilator openings should be located on the north side of the building, wherever feasible. Relative to the methods in use in American ice houses for rendering the walls non-conductive of heat, it can be said, in a general way, that the air spaces or width of openings in the walls to be filled with some insulating material, are too small to give the best results, and that further the insulation of the roof is usually very imperfect.

Good ventilation over the top of the ice is essential to prevent sweating of the ice. It must not, however, be created by a current of air, but simply be sufficient to keep the air sweet, as it is called in ice house parlance, or, in other words, pure and dry. It is also advantageous to provide small board windows half way down the sides, so that, when the level of the ice in the house gets below these windows, they can be opened during cold weather, or on cool nights, so as to purify the body of air at the lower level. The top of the ice is kept from direct contact with the air by a layer of sawdust, salt hay, or similar material. In the same way the sides of the ice pile are kept from direct contact with the walls of the building.

Proper drainage of the bed on which the ice rests is very important, and it must be done in such a way as not to allow currents of warm air from the outside of the house to penetrate the bed and thus come in contact with the bottom of the ice, and also so as to prevent the cold air in the house from escaping through the drain and thereby allowing the warm air at the top of the house to descend nearer to the bed. This can be accomplished by a properly constructed water seal in the drain pipe or culvert.

The floor in an ice house should be higher than the surrounding ground, so as to keep surface water out of the bed, and also to decrease the possibility of the warmth of the earth affecting the ice. Unless the ground is composed of porous materials, as sand or gravel, it is necessary to use a heavy bed of broken stone, slag, cinders, or ashes to afford better drainage. In the coal regions coal dirt is used very extensively for this purpose with good results. On top of the bed thus prepared it is customary to lay a loose floor of rough plank or mill slabs on mudsills or scantlings in such a way as to leave an air space below. The top of the bedding material, whatever it be, should be dishd from all sides toward the centre of the house or toward the centre of each compartment, if the house is divided into compartments, so as to give better drainage. An additional reason for this is, that if the mass of ice should have a tendency to slide on its bed, the resultant pressure would more likely be toward the centre of the mass. The side walls and partitions are frequently tied together by wrought iron rods, so as to

*Copyright 1890, by Walter G. Berg, and condensed from a forthcoming book on the subject.

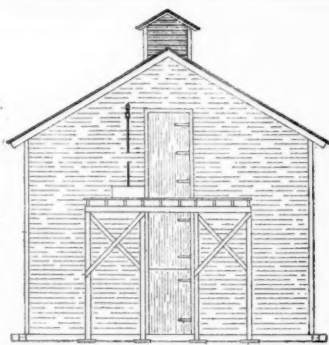


Fig. 1.

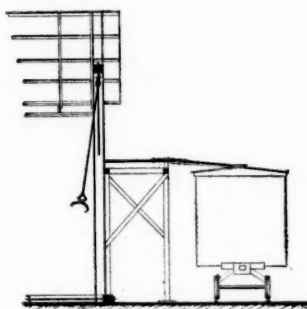


Fig. 2.

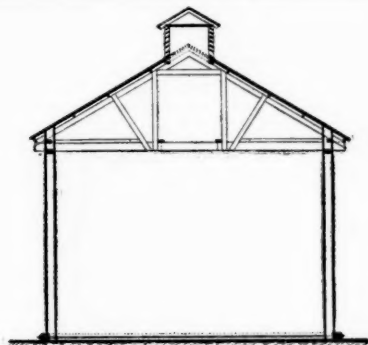


Fig. 3.

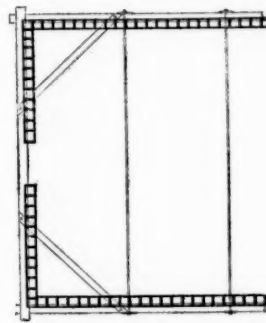


Fig. 4.

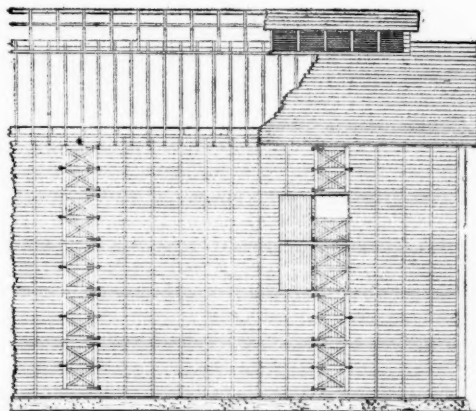


Fig. 5.

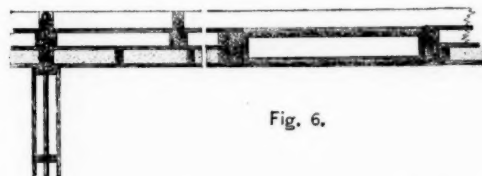


Fig. 6.

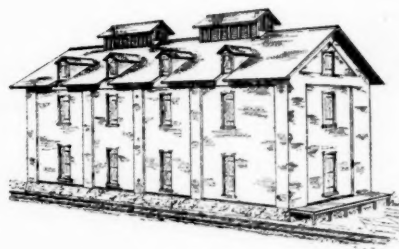


Fig. 11.

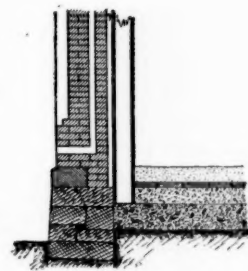


Fig. 12.

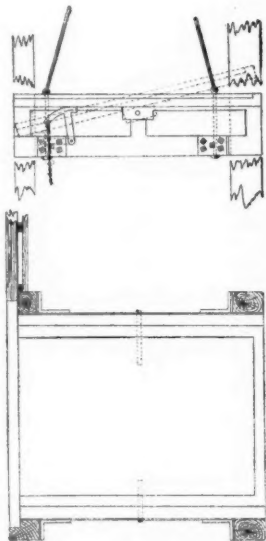


Fig. 8.

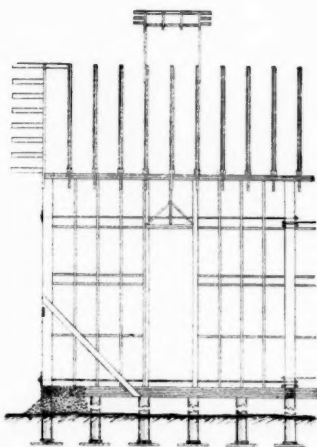


Fig. 9.

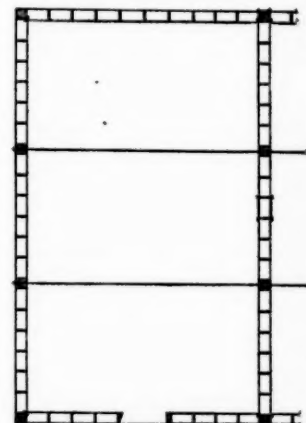
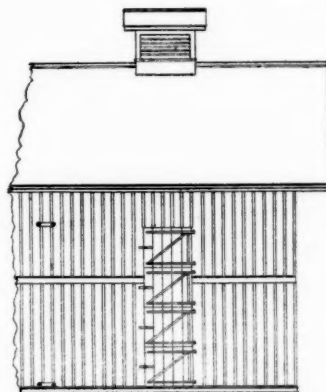


Fig. 10.

A FEW DETAILS OF ICE HOUSES.

be better able to resist the pressure of the ice, in case it should move in a body and bring an outward pressure on the walls.

Small amounts of ice are handled by means of a tackle hung from a beam projecting out from the building over the doors. Where large amounts of ice are handled daily, or while stocking the house, it will be more economical to provide a small hoist, cage, elevator, or traveler, operated by steam or horse power, arranged to dump the blocks of ice automatically when the proper level is reached.

The erection of an artificial ice making plant has, as far as the writer knows, never been undertaken by railroad companies. Having studied the question very carefully from the theoretical, practical and industrial standpoints, the writer is firmly convinced that the introduction on a railroad of an artificial ice plant, especially in Southern sections of the country, would not only result in a large saving to the railroad company, but, if located at some large town along the route, would be the source of considerable outside revenue.

The following approximate sizes of ice houses at different points, obtained from the best available information, will aid in forming a general idea of the usual dimensions employed:

Tyrone shops, Pennsylvania Railroad, 1,200-ton capacity, 33 ft. x 93 ft.
Harrisburg shops, Pennsylvania Railroad, 1,000-ton capacity, 25 ft. x 98 ft.
Cheyenne station, Northern Pacific Railroad, 700-ton capacity, 30 ft. x 50 ft.
Minnesota & Northwestern Railroad, 500-ton standard, 28 ft. x 48 ft. x 18 ft. height of frame.
Phillipsburg, N. J., Lehigh Valley Railroad, 1,600-ton capacity, 22 ft. x 125 ft. x 28 ft. height of frame.
Jersey City, N. J., Lehigh Valley Railroad, 2,000-ton capacity, 30 ft. x 125 ft. x 24 ft. height of frame.
Sayre, Pa., Lehigh Valley Railroad, 1,500-ton capacity, 32 ft. x 63 ft. x 32 ft. height of frame.
Nickerson, Kan., Atchison, Topeka & Santa Fe Railroad, 1,500-ton capacity, 40 ft. x 120 ft. x 20 ft. height of frame.
Mauch Chunk, Pa., Lehigh Valley Railroad, 1,500-ton capacity, 32 ft. x 95 ft. x 28 ft. height of brick side walls.
South Bethlehem, Pa., Lehigh Valley Railroad, 150-ton capacity, 18 ft. x 32 ft. x 12 ft. height of frame.

In regard to the cost of frame ice houses it can be

stated, in general, that, within certain limits, the larger the ice house the cheaper it will prove per ton storage capacity. Thus, a 25-ton house will cost from \$3 to \$4 per ton storage capacity; a 50-ton house, from \$2.25 to \$3 per ton storage capacity; a 100 to 500-ton house from \$1.75 to \$2.25 per ton storage capacity; a 1,000 to 2,000-ton house, from \$1.50 to \$2 per ton storage capacity. Very large storage ice houses at lakes or rivers, where the ice is harvested, can be built for about \$1 per ton storage capacity, and even for less in sections of the country where lumber is cheap. Exclusive of very large storage houses, the cost of frame ice houses can be placed at from 4 to 7 cents per cu. ft., a good general average being 5 cents per cu. ft. or about \$2 per ton storage capacity.

The following are descriptions of ice houses in use on railroads in this country:

Design for 50-Ton Ice House.—A very cheap ice house of about 50 tons nominal capacity can be built as follows: Size, 14 ft. square; height of frame from sill to eaves, 13 ft.; roof double pitched and covered with two layers of 1-in. hemlock boards; sills, 4 in. x 6 in.; plates, 2 in. x 4 in., halved at corners; studs, 2 in. x 4 in., spaced 18 in., mortised into the sills and spiked to the plates. The inside and outside of the studding to be sheathed with hemlock boards, nailed horizontally, thus forming a 4-in. space which is filled with sawdust. Two doors should be provided in one gable end, one above the other, both being made double by means of horizontal boards placed on the inside of the house, as it is filled with ice, and removed as the ice is taken out. The roof projects over the side 1 ft., and the space between the roof boards and the plate is left open to afford ventilation. A small ventilator, or louvered lantern, can be added on top of the roof if desired. The cost of such a building would be about \$125.

Fifty-Ton Ice House, Jersey City Terminal, Lehigh Valley Railroad.—The small ice house of the Lehigh Valley at its Jersey City terminal, used as a temporary storage house, has a nominal capacity of 50 tons, although 60 tons can be packed into it. The house is 20 ft. x 14 ft. in size, and the height of the frame from the sill to the plate is 9 ft. 6 in. It has a double pitched roof, boarded on the outside and beneath the rafters with 1 in. hemlock boards, and covered with tarred roofing felt. The sills are 4 in. x 10 in.; studs, 2 in. x 6 in., spaced 16 in.; cor-

ner studs, 6 in. x 6 in.; plates, 4 in. x 6 in.; rafters, 3 in. x 6 in., spaced 16 in.; nailers between rafters, 3 in. x 4 in.; outside and inside sheathing, 1 in. hemlock, the space between being filled with sawdust. There are two doors in one gable end of the house and a small louvered lantern on top. The cost is about \$150.

Standard 500-Ton Ice House, Chicago, St. Paul & Kansas City Railroad.—The standard 500-ton ice house shown in figs. 1, 2, 3 and 4, designed by H. Fernstrom, Chief Engineer, and C. A. Reed, Supervising Architect, C. St. P. & K. C., is a frame building, sheathed on the outside and inside with 1-in. boards, roofed with a double pitched roof covered with a double layer of 1-in. boards. The size of the house is 48 ft. x 28 ft., and the height from bottom of sill to top of plate 18 ft. At each gable end are three doors above each other, and at the height of the top of a freight car a platform or scaffolding with a swinging platform is arranged so as to be easily dropped on top of a car to facilitate the handling of ice in icing refrigerator cars. There is a small louvered lantern at the centre of the house, 5 ft. x 6 ft. in size. The sills are kept from spreading by four 1-in. iron rods placed across the house at the level of the floor.

The principal timbers used are as follows: Sills, 8 in. x 10 in., laid flat; corner posts, 8 in. x 8 in.; studs, 2 in. x 10 in., spaced 12 in., and notched over the inside of the sills to keep the foot of the studding from being crowded out by the pressure of the ice. The platform in front of the house is composed of 6-in. x 8-in. uprights, 6 in. x 6 in. caps, 2 in. x 8-in. joists, 2 in. floor plank and 2 in. x 6-in. X-bracing. The roof trusses are spaced 3 ft. apart and are formed of boards, as follows: Rafters, 2 in. x 8 in.; tie beams, 2 in. x 10 in.; straps, 2 in. x 6 in.

The approximate cost of this house is about \$1,100 to \$1,200, and the capacity can be considered as nearer 600 than 500 tons, as stated above.

Fifteen Hundred Ton Ice House at Sayre, Pa., Lehigh Valley Railroad.—The 1,500-ton ice house of the Lehigh Valley at Sayre, Pa., designed by A. W. Stedman, Chief Engineer, L. V. R. R., assisted by F. E. Schall, shown in figs. 5 and 6, is a well designed frame ice house, 63 ft. x 32 ft. 8 in., out to out, and 32 ft. high, from bottom of sill to top of plate. The house is divided into two compartments, each 30 ft. x 30 ft. inside. The distinguishing feature of this design is the combined use of an air space and a space filled with sawdust in the side walls, thus forming a double protection against the penetration of heat. A ventilator at the ridge of the roof, 8 ft. wide and 4 ft. high, extends nearly the entire length of the building, affording excellent ventilation. There are five double doors over each other on both outside walls of

each compartment and six such doors over each other in each gable end. These double doors, one outside and the other inside, are made to close tightly, leaving an air space of 6 in. between them. The inner doors are made in two pieces, sometimes called Dutch doors, to facilitate opening inwardly as the level of the ice is changed. The building rests on small masonry walls and the floor consists of 1-in. rough hemlock boards laid open on a layer of coal dirt. A number of drain holes 6 in. square are provided in the foundation walls to allow drainage.

The principal timbers used are as follows: Sills, 4 in. x 10 in., laid on top of the stone walls; inside studding footing on the masonry on the inside of the sill, 2 in. x 4 in., spaced about 20 in.; inside corner studs and door studs, 3 in. x 4 in. The inside studding is planed on both sides with 1 in. rough hemlock boards, and the space of 4 in. thus formed between the boards is filled with sawdust. Outside of this inside studding, which is double sheathed, forming a space filled with sawdust, as explained, there are additional outside studs, 3 in. x 10 in. hemlock, planed on two sides, footed on the sill of the building. These outside studs are spaced 3 ft. 4 in. all around the outside of the building, excepting at the doors, where 4 in. x 9 in. special door studs are set flush with the inside sheathing of the house. Hemlock nailing strips, 4 in. x 1 in., are fastened on each side of the 3 in. x 10 in. outside studs, next to the outside sheathing of the inner sawdust space. These nailing strips serve to support 3/4 in. tongued and grooved white pine boards, placed on one side, which are fitted horizontally between the outside studs, thus forming a 4 in. air space outside of the 4 in. sawdust space. The transverse partition at the center of the house between the two compartments is formed of 2 in. x 6 in. studs, sheathed on both sides with 1 in. rough hemlock boards, the 6 in. space thus formed being filled with sawdust. Several doors are cut in this partition to afford connection between the two compartments. The plates of the side walls are 4 in. x 10 in. hemlock; rafters, 3 in. x 8 in., spaced 24 in.; tie beams or ceiling joists, 3 in. x 10 in., spaced 4 ft., and sheathed on top with 1 in. rough hemlock boards. The roof is covered with 1 in. tongued and grooved hemlock boards, not over 8 in. wide. The ventilator is formed of 4 in. x 4 in. sills; 3 in. x 4 in. plates; 3 in. x 4 in. rafters, spaced 39 in.; and 3 in. x 4 in. studs, spaced 39 in. The single outside doors are 5 ft. 8 in. high x 4 ft. 4 in. wide. The frames of the outside doors are made of 6 in. x 1 1/2 in. stuff, and those of the inside doors are 4 in. x 1 1/2 in. All the doors are X-braced with 3 in. x 1 1/2 in. stuff and covered with 1 in. boards. The spaces between the roof boards and the plates are left open for ventilation. The building is tied together at the centre by two 1 1/2 in. iron rods.

The cost of this building can be placed at about \$2,500 to \$3,000, varying according to the locality and the depth of the foundations.

Two Thousand Ton Ice House at Jersey City, N. J., Lehigh Valley Railroad.—The two thousand ton ice house of the Lehigh Valley, at Jersey City, N. J., shown in figs. 7 and 8, designed by C. Rosenberg, Master Carpenter, New Jersey Division, Lehigh Valley Railroad, is a frame structure, 30 ft. 8 in. wide x 120 ft. 8 in. long, outside dimensions, and 24 ft. high from ground to eaves. It is divided into four compartments, each 30 ft. x 30 ft. There is a loading platform, 6 ft. wide on one side of the house along a track, the floor of the platform being level with the car floor. Two hoists on this platform connect with shafts inside the building, each hoist supplying two of the four compartments in the house. There are three sliding doors and one door in the roof at each shaft or hoist.

The cage of the hoist is provided with an arrangement for discharging the ice blocks automatically into the house at any desired height. The cage consists of a frame supporting a platform pivoted at its centre. The side of the platform next to the house is held up by a cam underneath it, which cam is attached to the frame. This cam is connected by a chain or rope to a ring at the foot of the hoist, which allows the length of the rope to be readily adjusted. When the cage has been hoisted to the desired height, the rope becomes taut and draws the cam from beneath the platform, allowing the side of the platform next to the building to drop and shooting the block of ice into the house, where men are ready to receive it. While filling the house this hoist is operated by a small portable steam engine or by horse power. For drawing the daily supply from the house, a smaller platform worked by a hand windlass is used.

This building has given very good satisfaction. Its cost can be placed at about \$3,000 to \$3,500.

Fifteen Hundred Ton Ice House at Nickerson, Kan., Atchison, Topeka & Santa Fe Railroad.—The ice house of the Atchison, Topeka & Santa Fe, at Nickerson, Kan., shown in figs. 9 and 10, with a nominal capacity of 1,500 tons, but able to hold 1,800 tons, is a frame structure divided into five compartments. The outside dimensions of the house are 120 ft. x 40 ft., and the height of the frame from the top of sill to bottom of plate is 20 ft. The side walls and transverse partitions are 14 in. thick. The inside dimensions of the compartments are 22 ft. 10 in. x 37 ft. 8 in. There are three louvered lanterns, each 5 ft. 6 in. x 4 ft. 6 in., on the roof, and four doors over each other for each compartment on one side of the house. The foundations are formed of posts set on plank in the ground, about every 5 ft. under the side walls and under the partitions. The sills are made of six pieces, each 2 in. x 12 in.; the plates are in three pieces, each 2 in. x 12 in. The corner studs and intermediate studs in the gable ends and partitions are 12 in. x 12 in., and the door studs are 6 in. x 12 in.; all other studs are 2 in. x 12 in., spaced about 27 in., and the corner braces, 2 in. x 6 in. The roof is double pitched, with roof trusses spaced about 30 in.; rafters, 2 in. x 8 in.; tie beams in two pieces, each 2 in. x 6 in. The building is kept from spreading longitudinally by four 1 1/2 in. rods in each compartment, and at each transverse partition by four 1 in. rods. Doors are each 3 ft. 10 in. high x 4 ft. 4 in. wide. Outside walls are ceiled on the inside with 1 in. rough boards, nailed horizontally, and sheathed on the outside with 1 in. upright boards and battens. The cross partitions are planed on each side with 1 in. rough boards. The ground inside the house is covered with a layer of broken stone to facilitate drainage. The cost of this ice house can be placed, approximately at \$3,500, dependent on local conditions and the depth of the foundations.

Fifteen Hundred Ton Brick Ice House at Mauch Chunk, Pa., Lehigh Valley Railroad.—The brick ice house of the Lehigh Valley at Mauch Chunk, Pa., shown in figs. 11 and 12, has a nominal capacity of 1,500 tons, but it can hold 1,700 tons. The house was built of brick, partly to lessen the danger from fire and partly on account of its proximity to the station building, there being a heavy passenger and excursion travel at this station. The building is 86 ft. long x 32 ft. wide, outside measurements, and 28 ft. high from the floor to the bottom of the

tie beam. The walls are built with a 2 1/2-in. air space in their interior. The brick wall outside of this air space is 9 in. thick in the panels and 13 in. thick at the pilasters; the brickwork inside of the air space is 4 1/2 in. thick. The brick walls rest on stone rubble masonry foundations. Inside the brick walls there is a timber frame, consisting of 3 in. x 6 in. studs, spaced 24 in., and sheathed on both sides with 1-in. rough boards, which thus form a 6-in. space that is filled with sawdust. The outside sheathing of this timber frame is kept 2 in. away from the inside of the brick wall, giving thus an additional air space. The protection thus secured by the 2 1/2-in. air space in the brick wall proper, the 2-in. air space between the brick wall and the timber lining and the 6-in. sawdust space, has proved very effective. The bond between the two parts of the brick wall on each side of the air space in the wall is maintained by iron plates laid between the cricks and extending across the air space, the plates being spaced 24 in. apart. The air space in the wall has openings near the foot of the wall and near the eaves, so as to keep the air fresh. The house is divided into two compartments by a partition at its centre. The floor is formed of an 8-in. to 10-in. layer of broken stones, on top of which there is a 6-in. course of coal dirt, covered by 2-in. rough boards laid open. On top of the boards a 6-in. layer of sawdust is spread before the ice is put into the house. Suitable drain holes are provided in the foundation walls to allow proper drainage of the bed. There are two ventilators in the roof, three doors in each gable end of the house and twelve doors on the side toward the tracks, the building being set with its back against the mountain. The roof is covered with slate on boards. The loss from shrinkage of the ice in this house is stated to be from 10 to 11 per cent. during one year.

The Development of the South.

The *Manufacturers' Record* gives a table showing the new enterprises organized in the Southern states during the past five years which we condense as below:

	1890.	1889.	1888.	1887.	1886.
Iron furnaces.....	56	50	19	29	28
Machine shops, etc.....	136	144	125	163	68
Agricultural implements.....	18	11	16	25	11
Furniture factories.....	68	74	68	35	23
Cotton mills.....	63	111	70	77	9
Mining and quarrying.....	551	605	460	562	174
Woodworking.....	622	1,066	796	726	448
Iron and steel works.....	106	67	40	71	25
Cotton seed oil mills.....	40	99	27	18	4
Total.....	3,917	5,135	3,618	4,430	1,575

The production of pig iron was for the first half of the year 961,900 net tons and the production for the last half is estimated at fully 1,000,000 tons, or an aggregate of 1,751,756 gross tons; a probable increase over last year of 25 per cent., as against 19 per cent. for the whole country. The miners' strike in Alabama has practically reduced the production of that state to a little more than 11 months and may amount to a shortage of about 70,000 gross tons in the year's production. There has been a marked increase in the appliances for utilizing pig iron in the matter of rolling mills and foundries, and a start has been made in steel making, which, however, has been much retarded by the attitude of the parties owning the basic steel patents.

The cotton crop is estimated at 8,000,000 tons, which is a gain of nearly 700,000 tons on the crop of the preceding year, which had the largest crop up to that time. The proportions of the crop taken by Northern and Southern mills during recent years have been as follows:

	1884-85.	1885-86.	1886-87.	1887-88.	1888-89.	1889-90.
North.....	1,419,689	1,777,676	1,679,658	1,787,121	1,780,186	1,792,850
South.....	266,000	340,000	397,929	443,373	486,603	519,478
Total.....	1,685,689	2,117,676	2,077,587	2,230,494	2,266,789	2,312,328

The number of national banks organized in the South during the year was 104, with an aggregate capital of \$10,935,000. Texas organized 63 of these, with a capital of \$5,950,000. The ratio of net earnings to the capital and surplus of all the national banks in the South was for the last fiscal year 9.98 per cent. In Texas it was 12.10 per cent., and 16.25 in Louisiana. Neither the banks nor business generally have been injured by the late monetary disturbances, only two national banks having failed during the year, and those closed their doors through the dishonesty of the officials, who have been arrested. The total assessed value of property for 1890 was \$4,403,506,536, as compared with \$2,913,436,065 in 1880; the increase for last year being \$270,000,000, as against an average for the 10 years of \$160,000,000.

Iron and Other Metals in 1890.

The *American Manufacturer* estimates the total production of pig iron for the year just passed at 9,091,979 gross tons, or 10,183,016 net tons. Last October the *Railroad Gazette* said that the production for the year would probably be one or two per cent. more than 9,000,000 gross tons. The annual production and average price for No. 1 anthracite has been as below, with the quantity for the last year as estimated:

	Production, gross tons.	Average price, cents.
1885.....	4,044,526	18.00
1886.....	5,683,329	18.75
1887.....	6,417,184	21.00
1888.....	6,489,738	18.88
1889.....	7,603,642	18.75
1890.....	9,091,979	18.40

The price of anthracite pig commenced at \$19.50 and has stood since May at \$18.00. At Pittsburgh, however, gray forge, which for January stood between \$18 and \$18.50, was between \$15.00 and \$14.25 for December.

Our make of steel ingots is estimated at 4,000,000, and of rails at 1,700,000 gross tons; and Mr. Swank returns the average price for the year in Pennsylvania at \$31.75, commencing at \$35.25 and dropping to \$28.50. The average price for 1889 was \$29.25. Both pig iron and

steel rails advanced through the latter half of 1889 to fall through 1890. Other kinds of iron were much more steady in price for the two years, neither rising nor falling proportionally.

From the statistical number of the *Engineering and Mining Journal* we take the following:

PRODUCTION OF COPPER IN THE UNITED STATES.

	Production, pounds.	Average price, cents.	Exports, \$100,000.	Imports, \$100,000.
1885.....	170,962,324	11 1/2	\$10,178,024	\$371,436
1886.....	161,309,587	11 1/2	5,671,748	341,089
1887.....	184,670,321	11 1/4	3,727,402	198,565
1888.....	223,481,588	16 1/2	5,777,485	384,635
1889.....	213,673,000	13 1/4	9,867,212	280,454
1890.....	274,610,000	15 3/4	8,548,793	

The price given is that of Lake copper in New York, and the values of both exports and imports include ores. Ores contributed over 60 per cent. of the value of our exports and over 80 per cent. of the value of our imports.

Our production of domestic copper from the small output of 12,600 tons in 1870 has risen to 121,650 tons from native ores, or to a total of 124,573 for 1890. We are now producing about 40 per cent. of the world's supply; nearly twice as much as any other country. And this year for the first time we take the first rank as iron producers. If there is no change in the circumstances which have led to the unexampled development of the latter industry, at the end of five or six years we will hold the same position in iron which we have lately been holding in copper.

The production of lead for the year was 187,000 short tons. For the last four years the production with the lowest, highest and average prices for the years has been as below:

	Production, short tons.	Lowest, cents.	Highest, cents.	Average, cents.
1887.....	160,700	4.25	5.12	4.50
1888.....	186,300	3.67	5.15	4.42
1889.....	190,300	3.68	4.84	3.92
1890.....	187,000	3.85	4.87	4.18

During a part of the last year lead was higher in the West than in New York. The reduced production of last year is due to the increased duty, which shuts out Mexican ores. The highest price was for October, and the closing price for the year was 4.10 to 4.05 cents per pound. Stocks, however, are very light, and there may be a decided rise in prices before the production of the country overtakes the demand.

The statistics of zinc for the last four years are as below:

	Production, gross tons.	Average price, cents.	Exports, \$100,000.	Imports, \$100,000.
1887.....	41,917	4.62 1/2	\$88,109	\$275,319
1888.....	45,922	4.91	34,577	203,909
1889.....	52,489	5.02 1/2	54,038	171,451
1890.....	60,714	5.55	39,937	140,700

The exports and imports are for the fiscal years ending with Jan. 30. Stocks of zinc are very low all over the world, and at times there has been a scarcity, particularly in Europe.

Concerning the American Society of Civil Engineers.

The following communication has been handed to us at the moment of going to press and too late for any comment. It is called out by a letter sent out by St. Louis members, which we do not reproduce, as it goes to all members of the Society.

OPEN LETTER.

31 SANDS ST., BROOKLYN, N. Y., Jan. 7, 1891.
Messrs. J. E. Johnson and M. L. Holman, Members Am. Soc. C. E., St. Louis, Mo.:

GENTLEMEN: Your "explanatory circular" is at hand. I wish that you could receive an answer to every one sent, and that each Member made acquainted with your position might with equal freedom give you his views of the issues involved in the coming Society election. I venture to say that you would then understand the true feeling of the membership much better than you are likely to do in any other way.

The Society has a Membership but little greater than 10 per cent. of all the engineers in the country. It must be admitted, however, that it contains all of the leading members of the profession. The Society, established on a high plane, has steadily improved in character and influence since its organization. There are few members who do not wish its standards elevated and its management made more perfect. I can tell you that this feeling is more prevalent among its resident than among its non-resident membership; that the former have for years been more keenly alive to the shortcomings of the Society than the latter. No criticisms have been more earnest or more severe, and I may say more openly expressed, than those of the resident Members, several of whom have had candor enough to express themselves directly to Mr. Bogart.

No one can say with truth that the officials of the Society have individually or otherwise acted in any selfish or sectional spirit. They have carefully studied the necessities of all classes and all sections, and if any Members have had just cause for complaint they have certainly always held the power to effect changes by open and concerted methods. A majority of the whole membership desires a forward movement to the end that the Society may keep abreast of the best engineering of the age, and any rational method of securing such a movement would find more support among the resident membership than elsewhere.

It appears that at the last annual convention the Nom-

inating Committee was virtually packed to secure selfish ends, and was not truly representative of wide interests. When its nomination for Secretary was announced, it was apparent to those best informed that the pretext for improvement in the management of the Society was to be made the cat's paw with which the chestnuts of selfish purpose were to be withdrawn from the fire. A strong reaction at once set in; Messrs. Bogart, Greene and Cooper promptly declined to serve on such a ticket, and this scheme of quieting all opposition fortunately failed. At this crisis Mr. Collingwood was induced to carry the standard of an indignant opposition.

Questionable political methods have been pursued since June last, and recently the several local societies have been manipulated, as ward primaries, with some degree of success, and if the Trautwine ticket is successful, I believe its success will be achieved by the use of influences and for purposes foreign to the high character of the Society, and that you, gentlemen, have lent your aid to the use of such methods. From your prominence in the support of this ticket you must be held responsible for the evils which will certainly follow the election of Mr. Trautwine (if he is elected), a responsibility which I presume from the deliberate and malevolent character of your letter you will not shirk.

Why is Mr. Trautwine selected? Why, I ask, should any one support him against Mr. Collingwood? Mr. Collingwood is an engineer of superior talent; a man of far more "systematic habits" than Mr. Trautwine, and prepared to devote his whole time to the office; is more alive to any existing defects, and knows better how to remedy them without wrecking the Society. Mr. Collingwood, gentlemen, is more fully informed on these points and more determined to promote reform than you yourselves can be. There is no evidence that Mr. Trautwine is interested in the welfare of the Society in any way. He has never attended its meetings, and his application for Associate Membership did not on its merits qualify him for election to that grade; he has no superior fitness for the office and seeks an honor for which neither his present prominence nor his future efforts can give a suitable or just equivalent. . . . You admit that you do not know him, neither do I, but I certainly can see no reason why the fortunate inheritance of a prominent name, a successful book, and the possession of "private means" should commend him to our suffrages. The Secretary should possess rare tact, capable of reconciling individuals and interests, and unless Mr. Trautwine likewise inherits this characteristic I know of no reason why his administration should not be a failure.

Mr. Trautwine will, if elected, owe his discovery for, and his election to, this office to the vigorous work of a few individuals, and he will need more than the firmness of his lamented father to prevent being used for the questionable purposes these individuals have in view. If Mr. Trautwine is to be judged by the character of his letters published during this canvass we have no evidence of such great strength of character. He will, I fear, be the agent only of a clique, of the local narrowness of whose views you can have no true conception, and to whose success you may point as in part the work of your hands.

Mr. Boller, formerly one of the leading managers of the Society, was, I believe, led to give less attention to it from certain criticisms made many years ago to the effect that the Society was managed by a ring in New York City; that criticism, however unjust, lost to the Society the valuable assistance of several able engineers. Mr. Brush is one of the best administrative men that the Society has ever elected to office, as well known in the West as in the East, of broad and progressive ideas; he is to day, for valuable society work, the equal of any candidate on any ticket, and he is not pledged to any policy other than the best interests of the Society.

Whatever charges may be brought against the Society, it cannot justly be accused of "local narrowness"; its membership is scattered over the world, and whether in the West, in Europe or in the tropics, I have been better served by this Society in all the details of professional interests than have the members of any other American society or than the several members of the British Institution I have had the pleasure of meeting. . . . If either Mr. Childs or yourselves desire to lower, however slightly, the standard of admission to membership; to make this a school for the education of the uninformed; to broaden its boundaries so as to admit a greater number rather than a higher grade of engineers; to make it more popular rather than more honorable; to make it the grindstone for men with local axes (and I know not what other you mean by escaping "local narrowness"), then why have you not the candor to set forth your policy more explicitly before allowing it to be put to the test of a vote?

It is only just to myself to say that I have known Mr. Bogart for 22 years, that I attended a meeting in 1877 at which a candidate for Secretary was nominated in opposition to him, and that I then voted against him. I have criticised freely certain features of his administration. He has, however, been the best Secretary the Society could have had; has done more work and made more personal sacrifices than he ever promised, or than was ever expected of him.

The Society, if respectable, must, like all learned societies, be conservative; it is a representative body, and cannot be greater than its members. Progress must be the result of growth, and our growth, with all its diffi-

culties, has been, if slow, still healthful. Half of the energy given to this forcing process of your movement devoted to the attention and care of the old plant would have produced better fruit. Such methods as yours, if persisted in, will produce a hybrid, fruitless as the barren fig-tree.

Under the great provocation of your circular, I have stated my views of the facts in the case explicitly, but I have an equal right to disclaim, with you, any "personal animus."

Yours very truly,

O. F. NICHOLS.

P. S.—Owing to the limited time before the election, I have sent this letter simultaneously to the engineering press of New York City for publication.

NEW YORK, Jan. 7, 1891.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The "Reform Ticket" circular sent out from the office of the Water Commissioners of St. Louis, by the conductors of a correspondence relating to certain candidates for office in the American Society of Civil Engineers, ought to meet with an earnest protest from every self-respecting member of the Society.

The fact that it seems advisable to some that a change should be made in the policy heretofore governing the Society does not justify the implied doubts cast on the integrity of a member of the society who for his whole professional life has been above reproach.

The dirty methods of reformers' politics should not be introduced into the elections of the American Society of Civil Engineers.

A MEMBER OF 25 YEARS' STANDING.

TECHNICAL.

Manufacturing and Business.

John E. Sexton, 624 Market street, San Francisco, Cal., has been appointed General Agent of the Borgion Rail Co.

The new roof for the extension of the rolling mill for the Lackawanna Iron & Coal Co., at Scranton, Pa., will be built by the Berlin Iron Bridge Co. The same company is also putting up the new casting shop for the Midvale Steel Co., at Nicetown, Pa.

The Consolidated Car Heating Co. has removed its main offices from the Commercial Bank building at Albany, N. Y., to its shops on Trinity Place in the same city. The change gives the company the much larger office accommodation it has for some time required.

The Riverside Iron Works at Wheeling, W. Va., manufacturer of steel pipe, steel slabs, billets, and nails, will increase its capital stock from \$1,000,000 to \$1,500,000, for the purpose of making improvements and adding other lines of manufacture.

The new muffle room for the Scovill Manufacturing Co. at Waterbury, Conn., is now completed. The side walls are of brick, and the roof is of iron, designed and built by the Berlin Iron Bridge Co., of East Berlin, Conn. The same company has also just completed a new boiler house for the Orono Pulp & Paper Co., at Basin Mills, Me.

Vaile & Young, of Baltimore, have erected a four-story warehouse at No. 219 North Calvert street. It is a 30 x 100 ft. building of brick and stone. The steady demand for the firm's patent metallic skylight, which is a system of glazing without putty, has necessitated new improved machinery and new facilities. Among the shipments lately made is one for a large order to Nebraska, for the Chicago, Burlington & Quincy road.

The directors of the Westinghouse Electric Co. at Pittsburgh have passed the following resolution: "That the stockholders of the company be requested to subscribe for the preferred stock to the extent of at least one share for every two shares of common stock, and that they shall have the option of either paying \$10 per month for each share until the total of \$50 a share has been paid, or \$25 a share in cash and the surrender of one share of common stock."

The Receiver of the United States Rolling Stock Co. has written to creditors of the company that no costs or legal expenses need be incurred by them in making proof of their claims. They are requested to forward to the Receiver statements to Nov. 21, 1890. Lawful claims will be listed and allowed, and will be entitled to dividends without further proof. The Receiver has obtained authority to issue to all creditors of the company, other than those representing its funded indebtedness, Receiver's certificates in exchange for the securities now held by them, or in extension or renewal of their demands. Printed copies of the proceedings, with a statement of the assets and liabilities of the company on Nov. 21, 1890, will be mailed to all creditors.

Bids for Building Guns.

The War Department on Jan. 6 opened bids for the construction of heavy cannon under the appropriation of \$3,500,000 made at the last session of Congress. The aggregate bid of the South Boston Iron Works, recently removed from Boston to Kentucky, was \$4,900,340, and that of the Midvale Steel Co. \$5,350,500. The South Boston Works submitted an alternate proposition.

Electric Light in Japan.

The first electric light company in Japan was formed at Tokio in 1886. With the lighting of the imperial palace an important advance was made in the industry, and since then other companies have been formed at Osaka, Kyoto, Nagoya and Kobi. It is estimated that there are now 11,000,000 electric lamps in the country, and of this number 8,000,000 are at Tokio alone. The capacity of the present five companies is rated at double the above number. The organization of ten further electric light companies is now under way. They will have a combined capacity of 16,000,000 lamps, of which 5,000,000 will be placed at Yokohama.

The Smoke Problem.

In Europe the problem of smoke prevention has, of late, attracted considerable attention. In Saxony a government appropriation of about \$1,750 has been made for practical tests of smoke preventing appliances, and at Vienna a commission was recently appointed to investigate and report upon the subject. In England, also, various sums of money have been collected to defray ex-

penses of investigation. The generally accepted opinion appears to be that domestic fire places are responsible for nearly as much of the smoke evil as factory chimneys. Fr. Siemens is quoted as saying that absolute smoke prevention can be secured only by the universal use of gaseous fuel and central stations for the manufacture of the gas.

The Progress of the St. Clair Tunnel.

The stone work of the portals of the St. Clair tunnel is now complete. The east portal wall is about 40 ft. high and nearly 150 ft. long. Some of the blocks of stone are over a yard square each. The opening of the tunnel is in the middle of the wall, and is 22 ft. in diameter. The excavation on the Canadian side is down to the required depth of 60 ft. for a small space just at the tunnel portal, and a large force of men is employed enlarging the excavation to the proper width, so that work may be begun at the proposed retaining walls, which will extend east from the portal about 1,650 ft. The retaining wall will be of the same heavy masonry as the portal, and will be further strengthened by anchorage walls extending at right angles into the bank. Inside, the tunnel is just now a busy place. The tram cars, drawn by mules, are carrying along the temporary tracks the loads of brick, cement, lumber, rails and other materials for the workmen. The calking, bricklaying, excavating, grouting, cementing, pipe fitting and tracklaying are all going on at once. The work of putting in the permanent track is going on from each end toward the middle, and the whole work is being carried on simultaneously, each working party keeping a little ahead of those engaged in the succeeding operation. The iron lining of the tunnel is being calked, and this work is almost completed. The brick bulkheads for the air locks had to be taken out, which proved to be no small undertaking, and though a force of men has been at work at it ever since the compressed air was taken off, much of the brick work of the wall at the Canadian end yet remains to be taken out. For the permanent way the whole tunnel is first lined with brick work laid in cement reaching half way up the sides. A floor of concrete made of Portland cement is next laid in the bottom, to make a level bearing for the track. On this floor, four lines of timbers are laid, as stringers, a pair on each side, so arranged that they will be under the rails. Across the stringers heavy needlebeams are laid 4 in. or so apart and fastened to the stringers with screw bolts. The beams and stringers are of Georgia pine, crosscut. After the needlebeams are laid a floor of cement is put in between the ends of the timbers and the wall of the tunnel on each side, to keep the track in place, and to make a foot walk for the employes. The rails weigh 100 lbs. to the yard. In the roof are pipes communicating with the pumping station, by which the air is pumped out and ventilation is secured, and at intervals along the walls safety ladders are built into the sides of the tunnel on which the track walker may take refuge when he meets a train. This work is all well advanced.

Black's Automatic Block Signal.

The Manhattan (elevated) road (New York City) is to put in 16 additional sections of Black's mechanical block signal. These signals are now in use between 56th and 116th streets on the Sixth Avenue line, and the new sections will be from 116th to 145th streets.

A Locomotive Speed Indicator.

A simple form of speed indicator for locomotives, designed by a Mr. Brettmann, is described in the *Schweizerische Bauzeitung*. It is offered as a substitute for some of the apparatus of this class now in the market, and, though less accurate, its simplicity is thought to recommend it.

The device comprises a clock dial with two index fingers, the dial being divided into 10 equal parts. One of the index fingers is driven by ordinary clockwork and makes one complete revolution per minute. The other index finger is in communication with one of the driving axles of the locomotive through a system of bevel wheels and an endless screw and wormwheel. The proportions adopted are such that the index makes one revolution for every kilometre passed over by the engine. Each division on the dial, therefore, corresponds to a hectometre, or about 328 ft. The indications of the two index fingers thus afford a ready means of determining the rate of speed of the locomotive, and a comparison of their speeds over the clock dial enables, at a glance, at least a rough approximation to the engine speed.

If both index fingers travel over the dial at the same speed, then the speed of the locomotive is exactly 60 kilometres per hour. If the minute hand moves more quickly than the other, the engine speed is less than this. If, however, the distance index moves more quickly than the minute index, then the engine speed is greater than 60 kilometres per hour. The apparatus is said to have given good results in recent trials.

The ErygmatoSCOPE.

What is known as Trouvé's erygmatoSCOPE is illustrated and described in a recent issue of the *Revue Industrielle*. It is an apparatus designed for the ready examination of boreholes in the earth.

It consists, essentially, of a powerful electric incandescent lamp, contained in a metal cylinder. One of the semi-cylindrical surfaces constitutes a reflector. The opposite side consists in part of thick glass, and allows the passage of the light rays, which thus illuminate the different strata passed through, the apparatus being lowered into the borehole by means of a cable. The lower side of the instrument is an elliptical mirror, inclined at an angle of 45 degrees. The upper end of the instrument is open, and enables the observer over the borehole to clearly see, with a small telescope, the reflected image of the side of the hole. The lamp is so placed that the vertical light rays are intercepted. The cable supporting the apparatus is made up of conducting wires for the lamp, and is wound on a drum with insulated trunnions. A portable electric battery furnishes the current.

The apparatus is said to have thus far given satisfactory results up to depths of nearly 1,000 ft. It has been used by the exploring expedition of the Portuguese government on the Mozambique coast, in Africa.

Electric Motors for Training Guns.

One of the more recent practical applications of the electric motor is to the training of cannon. The first experiments with an electric motor for this work were made at the Paris Exposition in 1889 with a 15-centimetre Canet gun, but did not admit of drawing final conclusions. Further trials have since been made by the Société des Forges et Chantiers de la Méditerranée in France, and have shown the electric motor to have a number of important advantages over hydraulic apparatus for training gear.



Published Every Friday,
At 73 Broadway, New York.

EDITORIAL ANNOUNCEMENTS.

Contributions.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

Advertisements.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

In our editorial note last week on the new railroad construction of the year there was a typographical error which would not have misled one at all familiar with the subject, but, nevertheless, should be corrected. We reported new construction by 210 companies or systems in the United States, with an average of 28.4 miles for each, not 284 miles. Under a system there are often included several lines, the individuality of which is but technical or temporary. Obviously it is misleading to count these separately in getting the average mileage built by each organization. The additions to be made to the table are: Georgia, 12, total for the state, 404; Kentucky, 3, state total, 192; Missouri, 33, state total, 148; Ohio, 22, state total, 176; Pennsylvania, 22, state total, 260; Tennessee, 6, state total, 172, and Texas 34, state total, 223. The figures of new track laid in Wyoming should read 62 miles, and in Ontario 71 miles, instead of as given last week. These corrections change the totals to: United States, 6,027, and foreign countries 1,128, making the grand total 7,155. The systems which built over 100 miles each are as follows:

Northern Pacific.....	303	Missouri Pacific.....	138
Canadian Pacific.....	276	Union Pacific.....	137
Monterey & Mexican Gulf.....	235	Pacific Short Line.....	129
Great Falls & Canada.....	204	Richmond & Danville.....	118
Great Northern.....	184	Seaboard & Roanoke.....	110

The form adopted for publishing our semi-annual and annual records of track laid necessitates more patient and careful work for its compiler than any other method; but we believe there is ample compensation for the extra labor and difficulty of preparing it in the valuable advantages it has over other forms. It gives an excellent idea of the companies engaged in railroad building and of those proposing to build. It is easy to refer to; the entire work of any company can be seen at a glance. It is comparatively easy to check off the lines built in any one state by reading down the columns containing the names of termini. And a table like this is the only adequate means of showing clearly, in addition to the lines laying track, the companies that have road under contract or projected, a very important feature, and to contractors the one of most value. And in this view we understand the bridge and car builders and other makers of railroad materials coincide. But with all our efforts it would be impossible to publish such a complete and accurate record, within a few days after the close of the period to which the figures are brought, without the aid of railroad officers, particularly chief engineers. These officers are always busy, and often pre-occupied, but the statistics

are almost universally given cordially and promptly. In many cases special records have to be made to answer our purpose; for these we thank the senders, as we also thank them for much incidental information which has enabled us to enhance the value of the table for those who use it but which does not appear on the surface. An examination of the records of the Northern Pacific, Union Pacific and Pennsylvania will show what careful work is done. In consequence of this prompt aid our tables will be found substantially accurate, and it will be unnecessary to trouble our readers with a revised or corrected record several weeks hence.

Among the latest contributions to the campaign literature of the American Society of Civil Engineers is a circular from the President addressed to the members. Among other things, he says:

The Board of Direction, at its meeting of Nov. 6, 1890, decided that the nominee of the Nominating Committee for the office of Secretary, being a "Non-resident Associate," was ineligible to that nomination by the Committee. The Board expressed no opinion as to his eligibility to fill the office of Secretary if elected to that position by a majority vote, as that question was not before it. The opinion of the Board is entitled to respect, and should not be treated as meaning more than was stated.

If this opinion was "treated as meaning more than was stated" it is the fault of the Board. We venture to say that nine out of ten members would have taken it as meaning that a non-resident Associate was ineligible to the office of Secretary. They would not have taken the time and pains to read the constitution so carefully as to dig out the fact that *any* Member (including Associates and Juniors) may lawfully be nominated by any other members than the Nominating Committee, and may be elected to and hold the office of Secretary. They would have concluded that a vote for a non-resident Associate would simply be thrown away. So the practical result of the opinion of the Board would have been to limit nominations to the office of Secretary to the narrow list of resident members. The technical press and not the Board has saved the Society from this injustice. Opinion differs as to whether the Secretary should or should not be a Member or an Associate, but no one claims, we believe, that he should be chosen from among the residents, provided that he is a resident during his term of service.

Of Mr. Collingwood Mr. Shinn says:

Mr. Collingwood has not sought the office; he had rather reluctantly (under the present circumstances) consented to accept the nomination, and he authorizes me to say in answer to criticisms: "I expect, if elected, to have no other place of business than the Society rooms; I should not seek other business. My first work, at all times, will be to attend to its affairs. If I succeed, it will probably be my *life work*; for I know of no better thing that I can do than to help to build up the Society to what we all would like to see it." This is the character of service that we need in the office of Secretary.

With these sentiments we quite agree, and we have not the slightest doubt that Mr. Collingwood means what he says. In fact, from the moment that the contest for the Secretaryship was narrowed to Mr. Collingwood and Mr. Trautwine our interest in it has considerably waned. The Society would be excellently served by either. There can be no doubt of Mr. Collingwood's independence, or of his zeal, capacity and high ambition for the welfare and usefulness of the Society. This we have said before, and we have repeatedly expressed our ideas of the fitness of Mr. Trautwine. The Society is fortunate in having two such nominations to choose from.

Last year was one of extraordinary activity in all branches of manufacture which go to supply railroads. Last week we reported 2,213 locomotives built by 14 works against 1,860 built by 16 firms in 1889, and 2,180 built by 17 in 1888. The increased output of freight cars has been even greater. We now have reports from 47 works, which built the immense aggregate of 98,074 freight cars in 1890, as against 70,546 built by 36 works in 1889, and 71,719 built by 43 works in 1888. Nearly every firm reporting increased its output. Four works built over 5,000 cars each, and one reached 10,000. Counting 310 working days, this is over 30 cars a day for one concern. The average output per firm was 2,087; in 1889 it was 1,960, and in 1888, 1,668. The net increase in the number of freight cars for six years has been, by Poor's Manual, as follows:

1889.....	65,054	1886.....	40,395
1888.....	54,239	1885.....	7,129
1887.....	105,973	1884.....	19,728
Average.....			
48,751.			

It is evident that the returns for various years have been quite imperfect, for the fluctuations from year to year could not have been so great as are shown in the table. The Manual gives the total freight cars in the United States at the end of 1889 as 1,060,164. Assuming that all those built in the railroad shops, and over

23,000 of those built by private works, have gone to fill vacant numbers, we should have at the end of 1890, say, 1,135,000 freight cars in the United States. Truly here is a field for the air brake and automatic coupler men, of which they have only scratched the surface.

The Prospects of the Presidents' Agreement.

A great many presidents' conferences result in failure; a few in substantial success. It is too early to tell to which class this week's conference will belong. But it is not too early to point out some of the conditions which it must fulfill in order to have any chance of joining the glorious minority.

In the first place it must aim at real reforms in railroad management, rather than at presenting a good appearance to the outside public. It must undertake primarily to deserve public confidence rather than to attract it by shallow pretenses. A failure to understand this distinction was the radical fault in the original agreement on which the Interstate Commerce Railway Association was based. Its promoters saw that the public demand for railroad securities had fallen off. As dealers in such securities, they wished to restore confidence. As a means to this end, they patched up an agreement to keep rates high. They did not inquire—in fact, they persistently refused to inquire—as to the detailed machinery by which the agreed rates were to be enforced. We know only too well what has been the result. The present agreement has somewhat better chance of success, because its promoters are less distinctively financiers, and more distinctively railroad men. So far as they are engaged in working the property rather than in working the market, they are more likely to make a substantial agreement than would otherwise be the case.

We do not mean to cast slurs on financial men as such. There have been great financiers who have also been great railroad men. Commodore Vanderbilt was a most marked example of this kind. He bought and built up properties to operate, not to sell; and in his operations he made reforms of the highest importance in traffic policy and management. But his case is somewhat exceptional. Most of the improvements which have been of lasting success have been the work of men of far less influence in Wall street, who have come personally in contact with the details of railroad operation. It will not be invidious to single out the name of Albert Fink as foremost in this class; but there have been many others whose work, though less prominent, has been no less honorable. To be permanently successful, any new agreement must be largely shaped by the counsels of men of this type.

Hitherto this has not been the case to the extent which one could desire. An effect on the price of securities, rather than any real harmony of action, has been the object generally in view. Jay Gould preaches peace in newspaper interviews; but his practice is sadly at variance with his preaching. He extends the right hand of friendship at New York; but he hits out savagely with his left at the Omaha Bridge. Even where there is no actual conflict between preaching and practice, there is none too much contact between them. The agreement between the Pennsylvania and the Vanderbilt lines which has been heralded through the newspapers has been somewhat slow in making its influence felt in the departments where it should naturally take effect.

If the officials are really in earnest, they will talk less about agreements than they have done and more about their enforcement; less about rate-making and more about rate maintenance. The first matter which must come up is that of joint agencies. We believe that the vast majority of people whose opinion is worth anything regard some such reform as a necessary condition for the maintenance of rates. If a road maintains a separate agency, it does so for the purpose of actually competing for business. To do this with any effect, it must give its agent a certain amount of discretion; not necessarily in the form of discretion to reduce rates or give extra facilities, but discretion to do as well by the shipper as any rival line will. How this discretion is used it is unnecessary to say. The more remote the competitive point, the greater is the difficulty of controlling the evil, or of holding the company responsible for the irregularities of its agent. If the agent is paid by commission, directly or indirectly, or if his position is made dependent on the volume of business secured, the case is still worse.

Efforts to avoid this result by a system of forfeits prove futile, because it is impossible to tell where the violation of an agreement begins. The line between what is legitimate and what is illegitimate is a very narrow one. No road is at any one time very much worse than its rivals. A slight difference—too slight

to be made the ground for enforcing a penalty—is sufficient to divert traffic from one road to another. The road which suffers can only avoid the evil by reprisals; and so the matter gradually gets more marked, while no road is exactly in a position to accuse the others severely. The difficulty can only be met by removing the cause.

Complaint is often made that under the system of joint agencies the weaker roads suffer, because everybody wants to ship by the better known lines. Theoretically, it ought to be possible to meet the difficulty by a good system of differentials. Practically, a division of traffic is much to be desired as a means for avoiding the trouble and friction. Under the pooling clause of the Interstate Commerce Law it is impossible to arrange this directly; but an arrangement as to clearing-house allowances may be made to accomplish the same end. It would be worth while for the railroad authorities, instead of moving for the wholly impracticable idea of having the pooling clause repealed, to study the methods by which the Southern Association has attained its ends.

If the presidents stop at advisory boards and rate committees, their work will prove no better than their predecessors'; nor can any amount of pains and penalties make up for the ineffectiveness of the old means of maintaining rates. But if they will take up the question of joint agencies, of a clearing-house system, of arrangement of differentials, and of possible methods of division of traffic, they have many elements of success in their favor. The roads are tired of war: the mileage built in the last four years has been small; that of the years 1886 and 1887 is old enough to be a known element in traffic and finance. Mr. Walker commands the confidence of all parties, and may be relied on to do his share in any reform if those who stand behind him will do theirs. We trust that the opportunity will be given to him.

Traffic Affairs in 1890.

The most important changes in currents of traffic during the past year have been those brought about by some of the new pieces of railroad built, and the article in another column describing these is the principal item under the heading we have adopted for this one. It is true that most of the new roads are short as compared with the great lines built in past years, but they are important in their several fields, and we must not belittle them by trying to grasp the railroads of 48 states in a single sentence.

As regards the great volume of railroad traffic of the country—that handled by the older roads—the year has been uneventful. The Lake Superior iron mines have served to emphasize the superiority of the Lake lines in their field, and the fact that the railroads are not to get coarse freight away from cheap water routes by any sleight of hand is more and more confirmed; and the large shipments of grain from Chicago by boat have only made this clearer. At the same time the boatmen on the Erie Canal complain that they have had an unprofitable season owing to the very good and cheap service afforded by the railroads from Buffalo to the seaboard.

Of course we say "uneventful" in its narrowest sense. The country has been prosperous and passenger traffic good. Freight has been heavy, while at the same time traffic managers have had to work as hard as ever to hold their respective shares. Gross earnings have been maintained and increased, but only by following the inevitable line pursued in previous years—accepting low rates and making large expenditures—so that the net results afford no ground for elation. This statement about fair earnings applies very evenly throughout the country. Even in the territory west and southwest of Chicago, whose roads have had occasion to do the loudest complaining about low rates, the older lines have kept their heads above water. This does not discredit their complaints, of course, but shows that they have something besides the troublesome competitive traffic to live on.

Freight rates from the Western grain fields to the Atlantic seaboard have followed the seasons, though not very closely. They were very low, and kept so by secret or open cutting, all along until the fall movement of this year's crops began to afford traffic enough to fill the cars of all the roads. The fall movement began in good season, but the lines east of Chicago did not succeed in raising the tariffs until November, and even then corn was left at 22½ cents. Wheat was put up from 20 to 25 cents, Chicago to New York, and finally at the very close of the year corn was put back to the latter figure, whence it was dragged down a year and a half ago by the Baltimore & Ohio, which insisted that it must bid more strongly for corn than for other grains. The roads west of Chicago did not succeed in raising the tariffs until the close of

the year, though the actual receipts from the traffic doubtless began to mend early in the fall, by reason of the abolition of temporary rates and cuts, and the adoption of a plan for the division of traffic. The trunk lines have settled a long dressed-beef war, one which took off probably all the profit on that and most of the profit on live stock, by recognizing the fact that there are two circuitous routes (through Canada) instead of only one. This result is yet to be formally announced, but it is probably inevitable. The Canadian roads only get about two-thirds the advantage they demanded, however, which tends to indicate that the direct lines are holding their own as regards this traffic.

Passenger wars have been neither numerous nor large, but have been quite severe while they lasted. West of Chicago they have kept company with the strifes in the freight departments, the sympathy between the two being natural. Fares to and from the Missouri River were low during the early part of the year, some of the time down nearly to half price. A sharp war between Chicago and Denver in the early summer made a big spurt in the business, and brought the rate down to \$7 for a short time. There has been some cutting between Chicago and St. Paul, and there was a brief war from St. Louis eastward in October; and the scalpers have probably made a pretty good living, take the year as a whole. But the trunk lines have kept the peace, except for a little tilt with the Rome, Watertown & Ogdensburg, and, generally, passenger matters have been quiet. Excursion business has probably brought in about the usual amount of money, but the art of largely increasing net earnings by this means is one which still lacks careful cultivation, speaking generally.

But while actual results have been commonplace, the tendencies in traffic matters have been interesting in several respects, and we may see some marked changes the present year. The most notable of these is the division of freight traffic agreed upon by the Chicago-Missouri River roads. The Atchison's line to Chicago has given it an enormous advantage, which the Alton stoutly refuses to yield, and without a pool this territory must probably be a battleground for a long time to come, but for the present there is a cessation of strife. There is no telling how well the agreement will hold when traffic falls off, nor what will be the outcome when some one tries to get it declared illegal under the law to prohibit pooling; but thus far the restiveness of the Atchison, which is the principal loser, seems to have been repressed very easily, so far as appears on the surface. It has not handed over its traffic to competitors gracefully, in all cases, but there is no evidence that it has disobeyed the orders of the dividing board.

The practical result of this quasi pool has been so satisfactory that the Chicago-St. Paul roads propose to adopt the same scheme for passenger traffic. The last named lines have abolished second-class tickets, an example which, if followed elsewhere, may mean something.

The Interstate Commerce Commission has broken its record for moderation by issuing an order naming specific rates on grain, but the roads have contested it, got it postponed and finally defied it. The conditions have, however, changed, the defiance is in some respects only formal and the powers of the Commission in the premises are at least questionable; so the end is not yet. The Commission has ordered the roads to carry live hogs as cheaply as they do pork, lard, etc., which, under the circumstances, was just; and has declared one-way party rates for passengers unjust, which decision a United States court has rightly overruled. The long pending carload-rate question was decided, but the enforcement of the order is not yet accomplished; perhaps it never can be. The Commission has arrested a general passenger agent for giving passes illegally and some freight officers for secret rate cutting, but has a hard fight to get proofs from unwilling witnesses.

Michigan has passed a law severely reducing passenger fares, but the roads are contesting it, relying upon a decision of the United States Supreme Court, in a Minnesota case, to the effect that legislatures are subject to review by the courts in such matters.

The Muscle Shoals Canal has been completed, but has not yet taken enough traffic to disturb the roads. The narrow gauge line from Colorado to Ogden has been made standard, and transcontinental competition will be more lively. The Poughkeepsie bridge route has opened not only a freight but a passenger route from Boston to Pennsylvania and Washington, but has not yet made much stir.

There are now 26 demurrage associations, and they are doing a good work, but no one can yet predict how complete a cure is possible for the evils felt in the car department. Cars were not as scarce this fall as they

were in 1889, generally speaking, but in Oregon and Washington the big wheat crop completely overwhelmed the roads. Finally, commercial organizations of a dozen large cities have organized a national transportation bureau which proposes to see that the railroads mind their Ps and Qs in dealing with the public.

Continuous Brakes in England.

The blue book of the Board of Trade for the half year ending June 30, 1890, enables us to again compare the efficiency of the Westinghouse and the automatic vacuum brakes as used in the United Kingdom. Of course the comparison would not hold good for service in the United States, because with our heavier trains and severer winter climate the automatic vacuum would show to still greater disadvantage. This would be even more true in freight than in passenger service, because the action of the automatic vacuum has not yet been made quick enough for our long and heavy freight trains. At least, if it has, the fact has never been demonstrated, and the withdrawal of this brake from the proposed trials in Australia must be taken as an admission that it cannot compete with the Westinghouse in all kinds of service. We have heretofore shown that even in English passenger service it makes more failures than the Westinghouse, leaving entirely out of the question the comparative power and quickness of the two types.

At the end of June, 1890, the engines and cars in the United Kingdom equipped with the two brakes were as follows: Westinghouse, 2,312 engines, 16,345 cars; automatic vacuum, 6,319 engines, 27,314 cars. This was 81 per cent. of the passenger stock of the United Kingdom. The train mileage of the two brakes in the half year was: Westinghouse, 30.1 million train miles; automatic vacuum, 39.5 million. This was 87 per cent. of the passenger train mileage of the United Kingdom.

The Board of Trade classifies failures under three heads: (1) Failure to act when required in case of an accident to a train or a collision being imminent. (2) Failure to act under ordinary circumstances to stop a train. (3) Delays to traffic because of defects or failure of brake apparatus, or neglect or inexperience of members of the working staff.

Under the first head the Westinghouse brake made no failures in the first half of 1890; the automatic vacuum made one—the Carlisle accident.

Under the second head the failures of material or in apparatus, leaving out of account failures due to faults of employés, were 5 for each brake.

Under the third head, still leaving out faults of employés, the failure of the Westinghouse were 158, due to burst hose, and 110 to other faults of apparatus or material. The failures of the automatic vacuum were 319. For comparison we have computed the failures per million train miles, leaving out those from burst hose. These are tabulated below, together with the figures drawn from the reports of 1889. Burst hose, of course, only causes failures of the third class.

Failures of the Second Class per Million Train Miles.			
	Westinghouse.	Automatic Vacuum.	
First half 1889.....	0.09	0.24	
Second " ".....	0.17	0.33	
First " 1890.....	0.17	0.13	
Average.....	0.14	0.23	
Failures of the Third Class per Million Train Miles.			
First half 1889.....	3.45	8.33	
Second " ".....	4.33	7.35	
First " 1890.....	3.66	8.68	
Average.....	3.81	7.92	

There was but one failure of the first class in the three half years, covering 186.2 million train miles. This was the automatic vacuum failure already mentioned.

Aside from any comparison between the two brakes, this record shows in a striking way the efficiency of a good continuous brake when used with a system of signaling by which proper warning is given. There is but one failure of the first class recorded for a passenger train mileage over 13 times as great as that of the Pennsylvania Railroad for 1889. The average failures of the second class, of the Westinghouse, are at the rate of less than two for the Pennsylvania's train mileage for a year.

The Railroad Building of 1890, and Some of the Prospects for 1891.

The 6,027 miles of railroad completed in this country in 1890 include a much larger list of important lines than has been the case for the last few years, and the end of the year sees work in progress on a number of important lines.

Some of the lines opening new routes are the Norfolk & Western and Louisville & Nashville to Norton, from the Mississippi Valley to Washington and to Norfolk; Georgia Southern & Florida, reaching Florida from the

northwest; Central of Georgia and Savannah, Americus & Montgomery line from Birmingham and Columbus to Savannah; Alabama Midland from Montgomery to the Atlantic Coast at Brunswick and Jacksonville; Knoxville Southern, from Marietta north to Cumberland Gap and Louisville; Rio Grande Junction, from Denver west to Salt Lake City and San Francisco; Union Pacific, Utah Northern line, from Ogden northwest to Portland, and the Great Northern Pacific Coast extension to the Pacific. The Seattle, Lake Shore & Eastern, Fairhaven & Southern and Seattle & Montana are building in the Puget Sound country to the Canadian Pacific to form a direct Seattle, New Westminster and Vancouver rail route.

Several changes in railroad affairs during the year should be noted here, though no new construction was involved. The terminus of the Northern Pacific was virtually changed from Tacoma to Seattle by the purchase of the Puget Sound Shore road. The East Tennessee, Virginia & Georgia has gained a line to Louisville by the Louisville Southern and to many other large cities by acquiring the Cincinnati Southern. It will soon reach Birmingham by a road it is now building. The Louisville & Nashville has a second connection to Cincinnati over the Kentucky Central just purchased, and the Norfolk & Western reaches Columbus, O., over the Scioto Valley & New England, and Washington over the Shenandoah Valley, now out of the Receivers' control. The Nashville, Chattanooga & St. Louis has leased the Western & Atlantic from the state of Georgia, extending its lines, and the Louisville & Nashville to Atlanta and Augusta. By a new agreement made between the Wabash and Chicago & Erie, the trains of the former will continue to use the Erie tracks to Chicago, but the parallel line will nevertheless be built.

The competing lines built or opened or begun during the year have been many, and if every state had a law to prevent the construction of lines not warranted by public necessity, many of them would not exist. We mention a few: Buffalo & Geneva; Philadelphia & Sea Shore; Georgia, Carolina & Northern; Pittsburgh, Akron & Western; Jacksonville Southeastern, and Louisville, Evansville & St. Louis lines to St. Louis; Chattanooga Southern; Macon & Atlantic; Union Pacific; Portland and Seattle line and Great Northern line to the Pacific.

The attempted classification which we make below of the longer lines may be unsatisfactory to some in many respects, but probably no more so than any other method that might be made. We have attempted to divide the new road into three classes, and to signify what lines might be judged to belong to each class. They are: First, lines built through well-settled sections to carry traffic which may be said to have been waiting for a railroad; second, connecting lines built to complete existing systems, and this will include most of the competing lines; and third, lines built into new territory, which are intended to aid the developing of the country. We would place under the first heading the Baltimore & Ohio lines in West Virginia, Lynchburg & Durham, Farmville & Powhatan, Rio Grande Southern, Fort Worth & Rio Grande, Union Pacific in Wyoming and Oregon, and Southern Pacific lines, and possibly also the Columbus Southern and Escanaba, Iron Mountain & Western. Track was laid on all these lines last year. It amounted to 417 miles.

Under the second, the extensions of the Maine Central; New York, Ontario & Western to Scranton; Lehigh Valley to Buffalo; Pennsylvania to Trenton; Philadelphia & Reading across New Jersey (Philadelphia & Sea Shore) and at Harrisburg; Western Maryland lines; Cape Fear & Yadkin Valley Wilmington line; Richmond & Danville to connect with the Marietta & North Georgia; Savannah, Americus & Montgomery to Savannah and to Montgomery; Alabama Midland; Baltimore & Ohio Chicago line; the Cincinnati, Wabash & Michigan line to Rushville, with the Evansville & Terre Haute line to near that point to join the two roads. Rock Island line to Lincoln, Missouri, Kansas & Texas; Missouri Pacific in Arkansas and Louisiana, and near Fort Scott; Chicago & West Michigan; Fremont, Elkhorn & Missouri Valley into Deadwood, and Burlington line toward that point, Union Pacific to Tacoma, and the Great Northern to the Pacific Coast. Track was laid on 18 of these lines, aggregating 671 miles.

In the third list: South Atlantic; Richmond & Danville from Siloam and Salisbury, South Bound, Louisville, St. Louis & Texas, Kentucky Union, New Orleans & Northwestern, Hutchinson & Southern, Kearney & Black Hills, Pacific Short Line, Chicago & West Michigan, Duluth & Winnipeg, Great Falls & Montana, Rio Grande Western in Utah, Pecos Valley, Wichita Valley, Corpus Christi & South America, Rock Island in Indian Territory, Burlington & Missouri River in Wyoming, and Oregon Improvement Co.'s lines. Most of the Canadian Pacific branches would be included here. Not counting those lines, all but two of the above lines added to their mileage last year, the total being 747 miles.

The extension of the Rock Island from South Omaha to Lincoln is just now attracting more attention than any other of the new lines. It seems likely that the present stand of the Union Pacific is taken to prevent the Rock Island from demanding an increased division from the traffic associations in recognition of its extension. But if the Union Pacific succeeds in annulling the contract allowing the use of its Omaha bridge, in which it probably result in important new lines, including

an independent bridge at Omaha, and the extension of the Rock Island southwest to Fairbury to connect with its St. Joseph and Colorado division. This line would be unnecessary for a long time if the Rock Island had running rights over the Union Pacific to Beatrice; but now that the company has gone so far as to build to Lincoln, it must build to its Denver line, if it cannot connect with it by any other means.

The Great Northern has made excellent progress on its Pacific coast extension, the seventh transcontinental line, and the present year will doubtless see several hundred miles added to the 121 miles already built. The work across the Rocky Mountains will be heavy, and will include a long tunnel, but it will probably not delay the road as seriously as similar work did other lines. A great amount of clearing and grading has been done on the northern part of the Portland & Puget Sound extension of the Union Pacific between Tacoma and Olympia, and the company promises to resume the work, now suspended. The line is to be built between Portland and Seattle by the Great Northern and Oregon Short Line jointly.

Though the new mileage of the New England states was somewhat greater last year than in 1889, the 32 miles built by the Maine Central is the only noticeable line. It gives the road a connection with its recently acquired Coos Valley division, and thus extends it into Quebec to the Canadian Pacific and the Quebec & Lake St. John lines. The latter road runs north to Quebec.

Between the Hudson River and the meridian of Toledo a number of lines are being built and others are proposed which promise a considerable amount of new track, but are chiefly interesting as strategic lines. In New York state the Lehigh Valley line to Buffalo will make one more complete trunk line between Lake Erie and New York City, and make a division of traffic which will be felt chiefly by the Erie. This line, however, will hardly be opened within the year 1891.

The proposed New York Central extension to the St. Lawrence River, as a parallel line to the Rome, Watertown & Ogdensburg, is needless, and is hardly warranted by any traffic at present existing or likely to be diverted to the Central's other lines. The Rome, Watertown & Ogdensburg is to build an independent road to Buffalo from Suspension Bridge.

The New York, Ontario & Western's coal extension southwest to Carbondale and Forest City, and that of the Lehigh Valley westerly into new territory south of Pottsville, are both understood to already have a good traffic. The Lehigh Valley, the Pennsylvania, and the Philadelphia & Reading lines to tide-water at New York Harbor are likely to be added to during the year. But a line which will receive more public attention is the Trenton Cut-off of the Pennsylvania now building to the Delaware River from near Downingtown, northeast, paralleling one of the lines of the Philadelphia & Reading and passing north of Philadelphia, so that through freight trains from the west will not be delayed passing through the yards there. The Lehigh Valley line from Bethlehem southwest to Philadelphia seems only a remote possibility.

The present inharmonious relations of the Philadelphia & Reading and Pennsylvania have resulted in new roads built and proposed which otherwise would not be considered. The most important of these is a new independent route to Pittsburgh, which, though roundabout, appears to "mean business." It will be operated by the Reading, Baltimore & Ohio and Western Maryland. The Susquehanna River is being bridged at Harrisburg by the Reading, and a connecting line is also to be built from Bowmansdale in carrying out of the plans. Lines are to be built by the Western Maryland to the Baltimore & Ohio, at Cherry Run, W. Va.; from Porters to the Reading at Chickies, and to Bowmansdale. The Philadelphia & Sea Shore, a parallel line across southern New Jersey to Cape May, has been delayed by litigation. It is to be operated by the Philadelphia & Reading.

Only six states have built more track than Pennsylvania, but its large total is made up of shorter lengths than that of most other states. Only two lines exceed 20 miles each. The Pennsylvania has built 33 miles against 11 miles in 1889, and the Philadelphia & Reading 36 miles against two the year previous.

The fruit trade of Baltimore will doubtless benefit through the Baltimore & Eastern Shore road, built across the Eastern peninsula. The 43 miles of new road with which it is credited does not include the 30 miles of reconstructed line.

No new roads begun since our summary made six months ago have added anything to Virginia's mileage, the increase being in the most westerly counties, on the Norfolk & Western. The new lines are now nearing completion, and several of them open up new routes. The Clinch Valley division west through Virginia to Norton is awaiting the connection to be made by the Louisville & Nashville through its line now building east from Cumberland Gap. The connection of these two great Southern systems will be an important event. On the extension northwest through West Virginia from the Pocahontas coal fields, the contractors recently began to lay track and everything is promising for its early opening. When it completes these two lines and the connection at the North Carolina state line with the Cape Fear & Yadkin Valley, which has been delayed, the Norfolk & Western will have built all the trunk

lines necessary to cover its legitimate territory, and new work in the future is likely to be confined to short branches. The Farmville & Powhatan and the South Atlantic & Ohio lines are the next longest pieces of new track.

The Roanoke & Southern and Lynchburg & Durham laid track on more road in North Carolina than in Virginia, the former 33 and the latter 41 miles. The Richmond & Danville's 70 miles also accounts for a good portion of the new mileage of North Carolina. Of the balance, 50 miles was laid by the Wilmington, Onslow & East Carolina, northwest of Wilmington, and 24 by the Atlantic Coast line. By next January these two lines may be joined, connecting Wilmington and Norfolk by a direct rail line. The new road built in North Carolina is not of special interest outside the state, except, perhaps, the Wilmington extension of the Cape Fear & Yadkin Valley, which was nearly all built in 1889. Only four lines have been built in South Carolina, and nearly 60 per cent. of the new track was laid on the Georgia, Carolina & Northern. The Columbia, Newberry & Laurens north of Prosperity parallels the Richmond & Danville, which also has a line from that point southeast to Columbia. The reason for building this 65 miles of road does not very clearly appear.

Georgia has stood ahead of the other states of the country in new mileage each year since the Southern states began to lead the other sections. This year the amount of new track is greater than in previous years, but despite the 400 miles, the long lines of the Great Northern and of the Great Falls & Canada have placed Montana first.

Altogether the railroad construction in Georgia in 1890 was to meet the demand of new trade, and it has been built in every section of the state. The Columbus Southern, Albany, Florida & Northern, and Middle Georgia & Florida lines come under this category. The necessity of the Chattanooga Southern across the northwestern corner of Georgia to Gadsden, Ala., has not yet developed. It parallels an existing road from Chattanooga to Gadsden.

Since work was resumed last year on the Georgia, Carolina & Northern, the Seaboard & Roanoke has been pushing the construction of that parallel of the Richmond & Danville line through South Carolina and Northern Georgia to Atlanta. The road is now in operation for over 150 miles and the whole line is nearly all graded. Perhaps next to this in importance among the new lines of the year in the Southern states is the Georgia Southern & Florida system. The last track on the line to Florida was laid in March, and since then the Macon & Birmingham has been built for 97 miles west of Macon, its northern terminus, and the Macon & Atlantic has been graded for 60 miles east of Macon. Right of way litigation has greatly impeded the progress of both these lines. Early in the year it seemed quite likely that 1890 would see the terminus of the former at Birmingham and the other at Savannah. While these lines have been building across the northern part of Georgia into the adjoining commonwealths a new route from eastern Alabama to Savannah has been opened via Americus through the construction of a 70-mile line across the southern part of the state by the Central of Georgia and the Savannah, Americus & Montgomery. The latter road is completing its line to Montgomery by building a 96-mile extension northwest from the Chattahoochee River. When completed it will probably take a large portion of the traffic now going over the Central of Georgia line to that point. The effect on the joint operation of the eastern division will be watched with interest. The Alabama Midland is an extension of the Plant System from southwestern Georgia which was finally completed this year. A third line is building from Montgomery, the Montgomery, Tuscaloosa & Memphis, now about graded for 80 miles northwest toward Tuscaloosa. Its further extension to Corinth, on the Illinois Central, is proposed. The object is to give a direct line between Memphis and Montgomery and points on the Plant System.

In Florida, the Florida Central & Peninsular has built to deep water at Tampa, and the Georgia Southern & Florida laid the last of its track. These two lines comprise the bulk of the new track.

The Alabama lines have been mostly short, and 15 companies have laid track. The extensions of the Montgomery, Tuscaloosa & Memphis, the Nashville, Chattanooga & St. Louis and the Savannah, Americus & Montgomery will make a more favorable showing of new track in 1891 than in the record just closed.

The activity in railroad building at Birmingham, which has been a marked feature of the work in Alabama for several years, shows little abatement, and in the East Tennessee, Virginia & Georgia, which will reach the city through the Briarfield, Blocton & Birmingham to Bessemer and then over the Alabama Great Southern, it secures a valuable line. The new Birmingham Mineral branches amount to 26 miles.

The extensions of the Georgia Pacific and the Louisville, New Orleans & Texas in Mississippi are intended as feeders for the main lines, and each penetrates a rich country. The 75 miles of road which they represent includes nearly all that has been laid.

The great work of the year in Tennessee has been the building of the Knoxville Southern. The East Tennessee road has a line between Atlanta and Louisville, and the Knoxville, Southern, Knoxville, Cumberland Gap &

Louisville, with the Louisville & Nashville, will form another. The Knoxville, Cumberland Gap & Louisville trains reached the Gap early in the year, and when those of the Louisville & Nashville and Norfolk & Western begin running it will be a centre with excellent connections and lines to the South, East and Northwest. The other new Tennessee lines promise no new connections. They are mostly in East Tennessee, but well distributed and well calculated to aid the industrial progress of the state.

The Paducah, Tennessee & Alabama has been built across Kentucky and the track now rests at the Tennessee state lines. Doubtless nearly as much track will be laid in Tennessee in 1891 by this line as was laid by it in Kentucky last year. In its present incomplete state it cannot have much effect on traffic, but if it is ever completed to Florence, Ala., to which it is projected, it must effect many changes in the direction of trade in its tributary territory. With its connections it makes a fairly straight southeast line from St. Louis. The Louisville Southern system is slowly completing its lines, but much mileage remains for this year's work, and, like the road just mentioned, it will not be able to assert much importance until it is finished.

The development of West Virginia is being greatly helped by late railroad construction. The lines built by the Chesapeake & Ohio and Baltimore & Ohio under the charter of the West Virginia & Pittsburgh have been well planned. Though amounting to considerable in the aggregate, they are short lines and reach new coal mines in "virgin territory." The coal carried by these lines can hardly be a factor further away than Pittsburgh. The tunnels and bridges of the Wheeling Bridge & Terminal System make that an expensive work. It is a very complete terminal system, though the main line (single track) is only six miles.

The extension of the Wheeling & Lake Erie east to the Ohio River and south along it to opposite Wheeling extends its eastern terminus to an important centre, an originating and distributing point for a large amount of traffic. Its former terminus at Bowerston connected with only one line, which also had a road to Toledo.

The early summer will probably see the completion of the new line of the Baltimore & Ohio from the terminus of the Pittsburgh & Western, at Akron, west to Chicago Junction, 70 miles. This will give a new and direct route from Pittsburgh to Chicago. The purchase of the Valley road has given the Baltimore & Ohio a good route to Lake Erie.

The Pittsburgh, Akron & Western is what the newspapers call a mysterious road. The purpose of its construction is not yet evident, so they solved it to their satisfaction by making it part of a new New York-Chicago line. The company has only 20 miles more to build to complete a line from Akron to Carey, and the Baltimore & Ohio's line across Northern Ohio is paralleled its whole length. Besides the 88 miles of new track laid, 50 miles of narrow gauge track has been made standard gauge.

In the other states east of the Mississippi the track is generally on very short lines, but a few companies have built long lines.

The Chicago, St. Paul & Kansas City extension to Kansas City from the north will shortly be ready for operation. The road must lease a Missouri River bridge and other track west of the river to enter Kansas City. It only serves to transfer the trains from a leased line to the company's own track, so that as a passenger line it is not very likely to be a new disturbing element. The Kansas City, Nevada & Fort Smith is anxious to enter the city from the south, and 12 miles of a terminal system has been built by the company under another name. The end of track is now 24 miles from Kansas City, extending south 47 miles.

The Houston, Central Arkansas & Northern, the Mississippi & Little Rock, and the Stuttgart & Arkansas River are the lines of most interest in Arkansas, and the last two are still continuing their work. The first is the only one reaching beyond the confines of the state.

Work is now in progress on an extension of the Missouri Pacific south through Louisiana to Alexandria, and this promises to be the most important line of the year in the state. The longest line of 1890 was the New Orleans & Northwestern from Natchez northwest, 66 miles, toward Little Rock.

Texas makes a very creditable showing. The Missouri, Kansas & Texas branches were built by the Receiver to connect various divisions of the road, finishing work already begun. The Wichita Valley line was built to prevent construction by another company of what the road thought its legitimate territory. The Fort Worth & Rio Grande is to be further extended to the Llano iron mines, and if these are as valuable as they are believed to be, decided benefit will accrue to the state.

Most of the new Colorado lines are narrow gauge. The Denver & Rio Grande extensions and the Rio Grande Southern are the longest lines, besides the joint line built by the Denver & Rio Grande and Colorado Midland, which completed a new standard gauge Denver-Ogden route. Another new standard gauge line, of only less importance to this, was opened by the Union Pacific between Portland and Ogden. This was done by changing its Utah & Northern division from narrow gauge, and materially shortening it. There is a heavy traffic between Oregon and Utah.

During the past few years the Burlington & Missouri River has built a line from Grand Island, 92 miles west

of Lincoln, northwest through Nebraska to the South Dakota state line and toward Deadwood, 487 miles altogether. It will be the second large company to reach the Black Hills. A branch is being built from near Newcastle to northeastern Wyoming. Last year 118 miles of track was laid on the two lines, 98 miles on the line to Deadwood.

The lines in California are extensions of the Southern Pacific.

The line built by the Northern Pacific in Montana from De Smet west to the Cœur d'Alene country will shorten its through main line considerably over the present more northerly route, but there is no indication that the present line will be abandoned for the new one. That is, the road just built is expected to have a profitable local traffic. The Great Falls & Canada line north from Great Falls to the Alberta coal fields will be of much benefit to the smelters and other concerns needing large coal supplies. The lines about Butte have also been extended some distance.

Besides the Union Pacific line north from Portland, the two controlled lines of the Great Northern in Western Washington are building rapidly. The Fairhaven & Southern has laid 43 miles this year, from Fairhaven south, and the Seattle & Northern has graded 87 miles north from Seattle to meet the former line. In other particulars the work in Washington is interesting. Except a short extension of the Central Washington branch, about all the new work is confined to the Puget Sound country. There the Northern Pacific has grading much advanced on two lines to the Pacific coast, from points on its main line south of Tacoma, and some track is laid. The line from Centralia is being paralleled by the Oregon & Washington Territory road.

Unjust Discrimination in England.

A case was recently decided in England by the Commissioners which has a bearing upon similar problems in America. The Corn Trade Association of Liverpool complained of the comparative rates on grain and flour charged by the London & Northwestern to Birmingham from Liverpool and from Cardiff. Birmingham is situated a little to the east of a straight line down from Liverpool to Cardiff. The traders of both these places sell in Birmingham, the seaboard cities being direct competitors in grain and flour. The distance from Liverpool to Birmingham is 98 miles and the rate (in two-ton lots) was 12s. 9d. per ton (say 14 cents per 100 pounds), while the distance from Cardiff to Birmingham is 173 miles and the rate was 8s. 4d. per ton (say 9 cents per hundred). Deducting terminal charges, the rates for actual conveyance worked out nearly six times more per ton per mile on Liverpool shipments than from Cardiff. The complaint of undue preference made by the Liverpool merchants constituted the first case before the Commissioners under the Railway and Canal Traffic act of 1888.

The railroad's defense was apparently based upon the ground that "public interest" demanded the preference; the real explanation being that the river Severn afforded a strong water competition between Cardiff and Birmingham which the railroad had to meet. The stress laid upon the interest of the public was because of the wording of the English law, which is as follows (Section 27): "In deciding whether a lower charge or difference in treatment does or does not amount to an undue preference, the court having jurisdiction in the matter or the Commissioners, as the case may be, may, so far as they think reasonable, in addition to any other considerations affecting the case, take into consideration whether such lower charge or difference in treatment is necessary for the purpose of securing in the interest of the public the traffic in respect of which it is made, and whether the inequality cannot be removed without unduly reducing the rates charged to the complainant."

Justice Wills gave judgment for the Liverpool traders, discussing the quoted section of the law at some length. The evidence as to the quantity of traffic diverted by the unequal rates was conflicting, but the judge held this to be of no account since the facts on their face showed Liverpool to be at a disadvantage. He also said that it was of no consequence to the public, whether the Birmingham shipments from Cardiff were received by rail or water. Further the public interest of Birmingham was but slightly affected either way, while Liverpool was largely against the low rate, hence the preponderance of public interest was against the railroad. Besides that, it appeared that there was a system of water communication between Liverpool and Birmingham, which might have influenced the Liverpool rate, had it not been controlled by the respondent railroad.

The judge held that the wish of the railroad to get the traffic away from the river Severn boats did not justify it in discriminating unduly against Liverpool. His words on this point are: "As a general rule it is against public interest that uncertainty should be introduced into the trade of the country by frequent, or violent, or arbitrary changes of circumstances, under which people engaged in business had to carry it on; or that artificial circumstances which might be created at the will, or the caprice, or for the self-interest of any one man or body of men, and which might be swept out of existence as lightly as they were created, should be permitted to interfere with the national course of trade."

The London Economist, Nov. 22, approves the decision

on the ground that various great industries might be established at Cardiff on the faith of a continuance of present rates and conditions, which would in time discover that they were at the mercy of the railroad company which had made their entrance possible, and which, whenever so inclined, might make their further stay impossible. The Economist does not think that a railroad should take upon itself to divert trade from one district to another, and there is a wide difference between assistance and interference.

The judge also complained a little of the wording of the law which seemed to cast upon the court the responsibility of deciding many things which would more properly have been laid down by legislation.

An alphabetical list of all railroads and passenger transportation lines in the United States, Canada and Mexico, with a number attached to the name of each road, is published in the *Official Guide* for January, for the benefit, chiefly, of the general passenger agents. A joint committee of the General Passenger and Ticket Agents' Association and of the Accounting Officers' Association, acting under authority of those bodies, recommended this action, and the list has been made up by the editor of the *Guide*. The object is to provide a system by which each road can be universally known by a number, so that it can be briefly and plainly indicated on tickets, tariffs, etc. It has been proposed that the scheme be utilized by placing the number of the issuing road on the back of each coupon of each foreign ticket and the number of the honoring road on the face of each coupon. The standard form of ticket recommended by the Association is fast being adopted, so that the work of assorting tickets by size, color, etc., is growing more difficult. The use of numbers would not only remove this difficulty, but make the work even easier than before. It is stated that the list now published is only a suggestion, no feature of it having yet been officially approved.

The live stock traffic into Chicago in 1890 was very great. The total receipts of all kinds were 13,678,000 head, 2,021,000 more than in 1889. The total car loads were 311,800, an increase of 46,600. The increase was in all kinds of live stock. The *Inter-Ocean* gives the following table showing the number of car-loads of live stock brought in by the 20 railroads entering the Stock Yards during 1890, with comparisons:

	1890.	1889.	1888.
C. & N. W.	80,460	67,762	47,827
C. & M. & St. P.	18,613	12,152	34,921
C. & R. I. & P.	10,743	33,490	27,129
Ill. Central	30,406	29,260	25,053
C. & Alton	22,679	20,765	16,611
C. & S. Fe & C.	22,660	21,895	24,715
W. St. & P.	24,215	12,287	6,315
C. St. P. & K. C.	18,943	17,195	15,606
C. & E. Ills.	11,458	9,565	3,564
Wis. Central	5,167	4,361	2,971
Mich. Central	2,146	1,348	1,240
C. St. L. & P.	810	900	954
B. & O.	799	846	706
C. & Atlantic	268	263	237
C. & G. T.	220	179	133
L. S. & M. S.	286	360	350
L. N. A. & C.	581	558	532
N. Y. C. & St. L.	1,126	1,473	1,291
P. Ft. W. & C.	201	241	278
	379	556	295

Three bills providing for the establishment of a Rapid Transit Commission for New York City were introduced in the New York Legislature on its opening day, Jan. 6. The provisions of all three are said to be substantially the same as those of the Fassett bill introduced last year, the differences being chiefly in the matter of appointing Commissioners and filling vacancies; and this is, in fact, the vital point. All public spirited men are interested in the early settlement of this pressing problem, but they take no special interest in the details of the proposed plans for metropolitan railroads as long as it is possible that their execution will be in the control of the present corrupt city government. One of the present bills, Senator Stewart's, provides that vacancies in the Board of Commissioners shall be filled by the Governor and Senate, while the others leave this power in the hands of the Mayor. Senator Fassett spoke in support of the former.

The Omaha bridge contest is still unsettled. The Union Pacific was enjoined from shutting out the trains of the lessee roads, but it nevertheless locked the switches, so that no Rock Island or St. Paul passenger trains have been run over the bridge. The Rock Island struck back at the Union Pacific by shutting it out of a small joint passenger station out in the wilds of Nebraska, and by other manoeuvres, but seems to have concluded not to press the matter until further developments. The Union Pacific officials at Omaha were hauled up for contempt of court in disobeying the injunction, but no decisive result, either in this or other legal proceedings, is yet announced.

NEW PUBLICATIONS.

The Rulo Bridge. A report to Charles E. Perkins, President of the Chicago, Burlington & Quincy. By George S. Morison, Chief Engineer of the Rulo Bridge.

This is a monograph of the kind with which engineers have become familiar from Mr. Morison's reports on other bridges built by him. It comprises 30 pages of text about 17 in. x 9 in., and 23 plates of the same size describing and illustrating the work with considerable

minuteness. The bridge crosses the Missouri River at the southeastern corner of Nebraska, and the project dates back to 1880. In 1883 borings were made, and in 1886 work on one of the piers was begun. Aug. 2, 1887, the first locomotive crossed the bridge, which was immediately opened to traffic, but owing to the heavy work in the western approach the bridge was not turned over to the operating department as completed until Nov. 1, 1880. The width of the river at ordinary stages being 1,600 ft., it was determined to reduce this to about 1,100 ft. by the construction of a dike above the bridge. This was completed May 7, 1885.

The bridge consists of three channel spans each 375 ft. long, and six 125-ft. deck spans, separated by iron piers 25 ft. long. The iron structure at each end of the channel spans is therefore 425 ft., and the entire length of the structure from end to end of the iron and steel work is 1,993 ft. The bridge is built on a grade of 0.4 of one per cent, ascending westward. The least clearance above standard high water is 47.8 ft.

The substructure comprises four granite piers supporting the channel spans and 16 small cylindrical piers supporting the towers which carry the deck spans. The piers rest on caissons sunk in the blue clay, the greatest depth being about 85 ft. below water. The total cost of the four piers, including freight, was \$342,017, and including the 16 small piers the total cost of the substructure was \$365,282. Very elaborate tables are given showing day by day the time, cost and materials used in the foundations, together with a diagram showing progress in sinking the caissons. The sinking through the clay was greatly facilitated by the use of a special air lock with an elevator arrangement, by which the air pressure in the caisson was made to lift a bucket of clay to a lock above the masonry. The movement in this special lock is the same as that commonly used in hydraulic elevators, except that the air from the caisson was made available for power. This lock is shown in detail in one of the large plates. The contractors for the masonry were Messrs. Drake & Stratton.

The superstructure was built by the Edge Moor Iron Company, and erected by Baird Brothers, under the immediate supervision of Mr. Andrew Baird. The material of the superstructure is steel and iron, the total weight of steel being about four million pounds and of iron nearly two million pounds. The total cost of the superstructure was \$196,480, and the total cost of the bridge and approaches, including protection works, \$1,020,385. The resident engineer in charge was Mr. Benjamin L. Crosby.

Recent Experiments on the Flow of Water Over Weirs. By M. Bazin, Inspector General of Bridges and Highways. Reprint from *Annales des Ponts et Chaussées*, October, 1888. Translated by Arthur Marichal, C. E., and J. C. Trautwine, Jr., C. E.

This pamphlet, which in this country appeared first as a paper before the Engineers' Club of Philadelphia, contains an exhaustive description of the long series of experiments conducted by M. Bazin. The results of these experiments are fully tabulated, and compared with those of Messrs. Fteley and Stearns, which were carried on at the Boston aqueduct in 1877 and 1879. The variation of the coefficient of discharge, as shown by the French tests, corresponds so nearly with that of the American tests as not to affect the practical value of the formula in either case. The experiments of M. Bazin were made by means of a carefully constructed channel, of uniform size and fall, into which was introduced a series of weirs, exactly similar in all respects excepting height. One of these weirs, being accurately gauged, was adopted as a standard by which the performances of the others were determined. As a check the values of the coefficients thus found were substituted in the formula and the results were found to agree.

This paper appears also in the *Proceedings* of the Engineers' Club of Philadelphia for January, 1890, which is just issued, one year behind its date. This example of deliberation in publication beats the record of the American Society of Civil Engineers.

First Lessons in Metal Working. By Alfred G. Compton. New York: John Wiley & Sons, 1890. Price, \$1.50.

Most of the technical schools in this country have long recognized the value of a practical course of instruction to be carried on in conjunction with the mental training of the student. Each of these departments has been found to excite in the student a thirst for knowledge which the other alone would gratify. The great drawback has been the want of some connecting link between the two courses. This is supplied, in a special case, by Prof. Compton's book, which is the outcome of his experience with pupils in the College of the City of New York. It gives the student a clear, simple and concise treatise on the practical part of his work; a most valuable compliment to the lectures given in the shop by the attendant mechanic. This little book deals in an elementary way with the subject of blacksmithing, and of bench work. It also touches upon the manufacture and properties of wrought iron and steel and foundry work. While designed principally for a text book, it is most interesting reading for any boy who has a mechanical bent and should find its way into many family libraries.

Journal of the Association of Engineering Societies. November, 1890. The contents of this issue of the Jour-

nal are: Some Recent Construction of Railroad Bridges, by James Ritchie; Improved Railroad Terminal Facilities in Providence, R. I., by S. L. Minot; the Asylum Street Crossing at Hartford, Conn., by L. B. Bidwell; Interlocking Signal Devices, by Isham Randolph. The usual Index to Current Literature appears.

TRADE CATALOGUES.

Illustrated Catalogue of the Wier Frog Company. Cincinnati, O. This is the first catalogue ever issued by this well known house, and is a good example of what such a catalogue should be. It shows and describes briefly a great variety of frogs, crossings, switches, switch-stands and street railroad work. In the illustrations of bolted frogs is shown Wier's patented steel filling, made of such shape as to reduce the liability of the bolts to shear and increase the elasticity of the frog. Eight different designs of spring rail frogs are shown, some of them being quite novel, and all good. Movable point frogs are also shown, as well as slip switches. The latter are shown as actuated by two rods from one double-acting stand. The rods move simultaneously in opposite directions, and the motion is carried to the points by longitudinal shafts placed in the middle of the track and working through toggle joints. The arrangement is very compact and efficient. A great variety of automatic switch-stands is shown, and the catalogue ends with some simple rules for laying turnouts, etc., compiled from Searles' Hand Book, together with other useful information.

Sunset Route to California.—The passenger department of the Southern Pacific Company has issued a descriptive pamphlet of the route from the Eastern States to California, via New Orleans and El Paso, under the title of "West by South, $\frac{1}{2}$ S." which is more than usually interesting. This pamphlet is in the usual form; that is, descriptive articles concerning cities and other localities of interest along the route, accompanied by illustrations and brief historical sketches; but it is richer in new material than most such books, having a large number of direct reproductions from photographs, printed in various artistic colors. The buildings, ruins, bits of scenery, etc., are not different, generally speaking, from those heretofore given to the public in similar works, but they are selected with better taste than the average. The introduction of the free-hand artist, with his insane desire to make something original, into the statistical department cannot be regarded as a success, however. Tables of distances and altitudes, lists of boarding houses, etc., can better be shown in plain, old-fashioned type.

The Wells Light. Keegan & Halpin, 44 and 46 Washington street, New York City. The agents have issued a new circular showing various applications of the Wells light with a list of those who have adopted it in the United States since January, 1890. It is stated that the last order from the Pennsylvania Railroad is for 300 lights. This useful apparatus has been described in the *Railroad Gazette*. The light is produced by passing kerosene oil through a heated burner, where it is converted into gas, the gas burning in an open flame which needs no protection in any weather.

Illustrated Catalogue of the Crosby Steam Gauge & Valve Company. 93 Oliver Street, Boston, Mass. This catalogue shows a great variety of instruments, including steam gauges, safety valves, lubricators, etc. Quite a chapter is given on the steam engine indicator and indicator diagrams. Another chapter, shorter but valuable, is on the polar planimeter.

A Midsummer Night's Dream: Being a Somnambulist's Ramble with Merchant & Co. and their friends, the Brownies. This is a little pamphlet, profusely illustrated, giving a list of the articles handled by this concern, such as roof plates, the star ventilator, ingot metals in great variety, brass and copper sheets, tubes, etc., and electrical supplies.

THE SCRAP HEAP.

Notes.

A bill is proposed in the Ohio Legislature prohibiting directors and officers of any railroad company from engaging in the business of mining or dealing in coal, stone, lumber, etc., along the line of such road, and providing against discrimination in freight rates in favor of any such company along their lines. The bill imposes a heavy penalty for violating its provisions.

The strike of the Baltimore & Ohio yardmen at Pittsburgh, begun about four weeks ago, was the subject of a summary order by Grand Master Sweeney, of the Switchmen's National Association this week. Beside the expulsion from the organization of 28 of the men implicated in the strike, Mr. Sweeney declared that the grievances presented by the Pittsburgh men were unconstitutional, and declared them null and void.

The strike of railroad employes in Scotland seems to have virtually failed, but the strikers are obstinate and desperate, and there has been considerable violence. At Glasgow the first part of the week there was a serious struggle between the police and a mob of strikers, who were stoning the dormitories owned by the railroad company and occupied by the new men who had been engaged to fill the places of the strikers. Many of the non-union men are working under police protection.

The New York State Supreme Court has reversed the decision of the lower court, which imposed a penalty of \$50 on the New York, New Haven & Hartford for charging more than three cents a mile for a ticket between

New York City and Morris Park, on the leased Harlem River & Port Morris road. It is held that the New Haven road, working under a Connecticut charter, is not subject to the limit of three cents a mile. The plaintiff's attorneys in this case were ready to begin several hundred similar suits if this one had been successful.

An Alarming Fact.

Bad water and dirty ice cause millions of cases of gastro intestinal diseases among passengers.—"Railway Surgery" in the *Railway Age*.

Commissioner Norton's Recommendations.

Railroad Commissioner Norton, of Ohio, in his annual report just submitted, recommends reform in the matter of laying railroad tracks in streets; the abolition of grade crossings and the enlargement of the powers of the Commissioner, permitting him to take any step deemed necessary to prevent accidents and to fix the responsibility for the same. The employment of minors as telegraph operators is severely condemned, and the Legislature is urged to prohibit the employment of persons under 21 years of age to receive or deliver train orders. The taxation of fast freight, parlor, sleeping and dining cars, belonging to corporations outside the state, is recommended, as is the proposition to compel the heating of all passenger cars with steam. It is understood that bills covering most of these recommendations have been prepared, and will be introduced in the present Legislature.

New Erie Stations.

The New York, Lake Erie & Western is building new stations at Akron, Galion and Cambridge, O., and Bradford, Pa. The station at Akron, it is estimated, will cost \$20,000 and the station at Galion \$15,000. Both will be built of stone, brick and wood. They will be heated by steam and lighted by electricity. The Cambridge station will be small and plain, and will cost about \$8,000. The Bradford station will cost \$12,000. It will have facilities for the use of natural gas both for heating and lighting. The plans of these stations were drawn by Mr. Archer, the company's architect.

The Richmond & Danville Vestibule Train.

The latest vestibuled limited train stands in the yards of the Richmond & Danville. It is the latest product of the skill, experience, and inventive genius of Pullman. It consists of a postal car, a combination dining and baggage car, a sleeping car, and an observation car, in the order named, being vestibuled. The Piedmont Air Line will run one of these trains out of Washington every day to Atlanta, and one out of Atlanta to this city. The postal car is uniform with the others, and fitted up with every modern appliance. The baggage and dining car has a small compartment for baggage, and next comes the kitchen. The pantry is fitted up handsomely with shelves of carved oak, brass fittings, etc. The sideboard is of carved oak with chinaware and silver in exquisite designs of the renaissance style. The finishing of the dining room is in antique oak, the upholstery is of white mohair cloth, beveled plate glass mirrors are set in every available portion of the wall space, the tables are of heavy oak, and the ceiling is beautifully painted in arabesque designs. The sleeping car is finished in mottled mahogany, and contains a drawing room and stateroom in addition to twelve ordinary sections. It is upholstered in white mohair cloth, and has draperies of silk plush. The stateroom is finished in satin-wood, and has not only a private lavatory but a retiring room of its own, so that there is no occasion to leave it except for meals. The six washstands in the car are nickel-plated, and have both hot and cold water. There will be a number of ladies' maids, colored women in uniform, trained for this service, and intended to assist ladies and children in their toilets, etc. The observation car contains some sleeping berths, but the larger portion is fitted up like a handsome parlor. It is finished in mahogany and silk embossed plush. There are two mahogany secretaries and a library. There is also a buffet, which will be in charge of an artist in the mixing line, who will furnish cigars and liquors of all kinds. This room is the lounging room for the whole train. The trip of 650 miles between Washington and Atlanta will be made in 19 hours, five hours less than the present time. These trains will be the first to be put on any Southern line for all the year. The cars are named, as follows: Observation cars, Chevalier, Consort, Courier; dining and baggage cars, Acileus, Demitrius; regular sleepers, Senator, Southron, Diplomat. All will be lighted by Pintsch gas and heated by the New York safety system. Every section will have its own lights. Electric bells are also supplied everywhere.—*Washington Post*.

Illinois Railroad Commissioners' Report.

The Illinois Board of Railroad and Warehouse Commissioners has made its twentieth annual report which covers the year 1890. There is a continued tendency to better equipments, improved roadbeds and safer structures. The report favors additional legislation to provide greater safety by interlocking switches and signals. There are 606 crossings unprotected by any mechanical device. Grain inspection at East St. Louis has heretofore been done by the state of Missouri and legislation is suggested by which Illinois may have jurisdiction over so important a business, carried on within the borders of the state. The mileage in Illinois June 30, 1890, was: Main line, 10,163 miles; second, third and fourth tracks, 925 miles; side tracks, etc., 2,928 miles; total, 14,017 miles; an increase in total track over 1889 of 520 miles. The total earnings from operation in Illinois are: Passengers, \$14,211,044; mails, \$1,579,848; express and extra baggage, \$1,479,541; from other sources, \$193,431; total passenger department, \$17,463,866. Freight department: Freight, \$45,856,706; other sources, \$276,891; total, \$46,133,597; miscellaneous, \$1,892,789; total earnings from operation in Illinois, \$65,490,253. There are 557 cars and 20 engines to every 100 miles of track in the state. There were 182,680 employes, whose yearly compensation was \$17,705,205. The total number of persons killed was 508, 27 of these being passengers.

Engineer Hansel in his report recommends that automatic brakes be put on all cars and locomotives; approves the Master Car Builders' type of coupler; recommends that the absolute block system to be used where traffic is dense; that a code of uniform signals be adopted; that all crossings at grade which may be hereafter constructed be protected by interlocking switches; that the board be furnished with statistics showing the physical condition of each road, also plans for bridges over 16 ft. long; that each railroad be inspected once a year; that heating of passenger cars by steam from the locomotive is practicable and should be adopted.

Bridge Disasters.

The pontoon bridge over the Arkansas River at Pine Bluff, Ark., was blown to pieces and seven of the boats

disabled and sunk on the morning of Jan. 1, impeding traffic a week.

On Saturday last, during a heavy freshet in the Great Kanawha River in West Virginia, the falsework for the steel superstructure of the Charleston & South Side bridge, building at Charleston, was carried away, being forced out of position by driftwood, entailing a loss of \$5,000. The falsework was substantially put up, and most of it lodged at the head of Williams Island, a few miles below. The Keystone Bridge Co., of Pittsburgh, Pa., had the contract. The trestle was a little over 200 ft. long.

Lehigh Valley Station at Easton.

The Lehigh Valley has completed a fine brick station at Easton, Pa., which was opened on Jan. 1. It is of Gothic architecture, and surmounted by a high tower. The tracks are on a high level at Fourth street, where the station is located, and for the convenience of passengers the company has built an elevator running to the street below.

The Very Latest Pneumatic Signal.

J. M. Brohard, of Clarksburg, W. Va., has just been allowed a patent on a pneumatic signal which consists of a disk 1 ft. in diameter, made of two pieces of plate glass placed $\frac{1}{2}$ in. apart in a copper band. There is an opening in the bottom of the band to which is soldered a pipe, which connects with a copper reservoir placed above the signal. At the top of the band a $\frac{1}{2}$ -in. pipe protrudes from between the glass plates, to which is affixed the air tube, which runs to the office from which the signal is to be operated. A red liquid is poured in the reservoir, and flows down through the pipe, up between the glass plates of the disk, completely filling the space and making the normal condition of the signal red. The signal man changes it to white by blowing through the tube, thus forcing the red liquid back into the reservoir. There is a stop-cock connected with the mouth-piece of the tube, which, when shut, prevents the air from escaping and keeps the signal white. After a train has passed, all he has to do is to turn the stop-cock off, allowing the air to exhaust, when the red liquid flows back to its place between the plates. Tests have been made with a full-sized signal, and it has been found that it operates instantly at a distance of 100 ft. from the office with but slight exertion on the part of the operator.

The Sex of the Locomotive.

Wonder why they always call a locomotive "she?" Maybe it is on account of the horrible noise it makes when it tries to whistle.

LOCOMOTIVE BUILDING.

Last week the Rhode Island Locomotive Works shipped four 10-wheel engines to the Union Pacific, and two 10-wheel engines were sold to the New York, New Haven & Hartford. Four more will be delivered in a few weeks. The locomotives have 18 x 24 in. cylinders, 55-in. wheels, 54-in. boilers with wagon top of $\frac{1}{2}$ spang steel, and fire box 78 $\frac{1}{2}$ x 35 $\frac{1}{2}$ in. The weight is 103,400 lbs. All wheels are fitted with the American steam brake. The Mexican Northern has also been shipped the first of three locomotives ordered.

The Los Angeles Terminal has ordered two 8-wheel and two 10-wheel locomotives from the Baldwin Locomotive Works.

The Wheeling & Lake Erie has purchased 10 new freight locomotives to be used on its Ohio River extension. Six of them were delivered recently, and the others will be delivered in a few weeks.

CAR BUILDING.

The Cincinnati, Hamilton & Dayton has ordered of the Dayton Car Co. 300 new box cars of 28 tons capacity. The cars will be delivered in April.

BRIDGE BUILDING.

Delaware, Lackawanna & Western.—For the past six months or more the iron bridges over the highway east of the Bergen tunnel at Hoboken, N. J., have been removed and trains have been running over a temporary structure. The object was to send the structures back to the Passaic Rolling Mills Co., at Paterson, to be strengthened by the addition of extra trusses. A force of men is now engaged putting the bridges back in their original positions.

Elkins, W. Va.—The West Virginia Central has commenced work on the abutments for a new steel railroad bridge 180 ft. long at Elkins, Randolph County, W. Va. One abutment is almost finished, and work has been begun on the other abutment and the piers.

The electors of the town of Elkins last week voted to spend \$12,000 for improvements, including two foot and highway bridges.

West Union, W. Va.—John C. Couleman, Inspector for the County Court of Doddridge County, W. Va., will receive bids up to Jan. 20 for the steel superstructure and for the abutments for two steel bridges to be built across Nutter's fork.

Wheeling, W. Va.—The Wheeling Bridge & Terminal Co. will build a double-track steel bridge over Wheeling Creek diagonally from the mouth of Chapline Hill tunnel to its proposed freight yards and union passenger station in that city.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Central Ohio, 3 per cent., on the common and preferred stock, payable Jan. 31.

Central of New Jersey, $\frac{1}{2}$ per cent., payable Feb. 2.

Cumberland Valley, quarterly, 2 per cent., payable Jan. 1.

Delaware, Lackawanna & Western, quarterly, $\frac{1}{2}$ per cent., payable Jan. 20.

Detroit, Hillsdale & Southwestern, 2 per cent., payable July 5.

Evansville & Terre Haute, quarterly, $\frac{1}{2}$ per cent., payable Jan. 22.

Georgia, quarterly, 2 $\frac{1}{2}$ per cent., payable Jan. 15.

Granite, \$2 per share, payable Jan. 1.

Huntingdon & Broad Top Mountain, semi-annual, 3 per cent., on the preferred stock, payable Jan. 16.

Long Island, quarterly, 1 per cent., payable Feb. 2.

Mahoning Coal & R. R. Co., semi-annual, 2 $\frac{1}{2}$ per cent., and extra 2 per cent., payable Feb. 2.

Nashville, Chattanooga & St. Louis, quarterly, $\frac{1}{4}$ per cent., payable Jan. 26.

Paterson & Hudson, 4 per cent., payable Jan. 2.

Paterson & Ramapo, 4 per cent., payable Jan. 2.

Petersburg, $\frac{1}{2}$ per cent., on the preferred stock, payable Jan. 1.

Pittsburgh, Ft. Wayne & Chicago, quarterly, $\frac{1}{4}$ per cent., payable Jan. 6; and special quarterly $\frac{1}{4}$ per cent., payable Jan. 2.

Rock Island & Peoria, semi-annual, 2 $\frac{1}{2}$ per cent., payable Jan. 1.

Rome, Watertown & Ogdensburg, 3 per cent., payable Feb. 16.

Rutland, 1 per cent., on the preferred stock, payable Dec. 31.

Vermont Valley, 3 per cent., payable Jan. 1.

Worcester, Nashua & Rochester, \$3 per share, payable Jan. 3.

Meetings.
Meetings of the stockholders of railroad companies will be held as follows:

Addison & Pennsylvania, annual, Addison, N. Y., Jan. 12.

Albany & Watertown, annual, Norfolk, Va., Jan. 20.

Allentown, annual, 227 South Fourth street, Philadelphia, Pa., Jan. 12.

Arkansas & Louisiana, annual, Washington, Hempstead County, Ark., Jan. 28.

Chicago Belt, special, Chicago, Ill., Feb. 24, for the purpose of making a new lease with the Chicago & Western Indiana.

Chicago & Western Indiana, special, Chicago, Ill., Feb. 24, to consider proposed improvements.

Columbus, Hocking Valley & Toledo, annual, Columbus, O., Jan. 13.

Dallas & Greenville, annual, Dallas, Tex., Jan. 20.

Dallas & Waco, annual, Dallas, Tex., Jan. 20.

Dallas & Wichita, annual, Dallas, Tex., Jan. 20.

Kings County (Elevated), annual, Brooklyn, N. Y., Jan. 14.

Lehigh Valley, annual, Philadelphia, Pa., Jan. 20.

Little Schuylkill, annual, 410 Walnut street, Philadelphia, Pa., Jan. 14.

Loyalsock, annual, 228 South Third street, Philadelphia, Pa., Jan. 12.

Mine Hill & Schuylkill Haven, annual, 119 South Fourth street, Philadelphia, Pa., Jan. 12.

Nesquehoning Valley, annual, 226 South Third street, Philadelphia, Pa., Jan. 12.

New York, Ontario & Western, annual, 18 Exchange place, New York City, Jan. 21.

Northeast Pennsylvania, annual, 240 South Fourth street, Philadelphia, Pa., Jan. 12.

North Pennsylvania, annual, Philadelphia, Pa., Jan. 14.

Norwich & Worcester, annual, Worcester, Mass., Jan. 14.

Philadelphia & Baltimore Central, annual, 233 South Fourth street, Philadelphia, Pa., Jan. 12.

Philadelphia & Reading, annual, Philadelphia, Pa., Jan. 12.

Philadelphia, Wilmington & Baltimore, annual, Wilmington, Del., Jan. 12.

Pittsburgh & Lake Erie, annual, 77 Fourth avenue, Pittsburgh, Pa., Jan. 27.

Pittsburgh, McKeesport & Youghiogheny, annual, Pittsburgh, Pa., Jan. 27.

Pontiac Pacific Junction, annual, Montreal, P. Que., Jan. 14.

Rutland, special, Rutland, Vt., Jan. 13, to consider the cancelling of the lease of the road to the Delaware & Hudson Canal Co., and to execute a lease of the same property to the Central Vermont.

St. Catharines & Niagara Central, annual, St. Catharines, Ont., Jan. 26.

St. Louis, Vandavia & Terre Haute, annual, Greenville, Ill., Jan. 13.

Schuylkill & Lehigh Valley, annual, 228 South Third street, Philadelphia, Pa., Jan. 12.

Toledo & Ohio Central Extension, annual, Marietta, O., Jan. 12.

Western & Atlantic, annual, Atlanta, Ga., Jan. 21.

Western New York & Pennsylvania, annual, 242 South Third street, Philadelphia, Pa., Jan. 12.

Railroad and Technical Meetings.
Meetings and conventions of railroad associations and technical societies will be held as follows:

The Southern & Southwestern Railway Club will hold its next meeting in Atlanta, Ga., Jan. 15.

The New England Railroad Club meets at its rooms in the United States Hotel, Beach street, Boston, on the second Wednesday of each month, except June, July and August.

The Western Railway Club holds regular meetings on the third Tuesday in each month, except June, July and August, at the rooms of the Central Traffic Association in the Rookery Building, Chicago, at 2 p. m.

The New York Railroad Club meets at its rooms in the Gilsey House, New York City, at 2 p. m., on the third Thursday in each month.

The Central Railway Club meets at the Hotel Iroquois, Buffalo, the fourth Wednesday of January, March, May, September and November.

The Northwest Railroad Club meets on the first Saturday of each month, except June, July and August, in the St. Paul Union Station at 7:30 p. m.

The Northwestern Track and Bridge Association meets on the Friday following the second Wednesday of each month at 7:30 p. m. in the directors' room of the St. Paul Union station, except in the months of July and August.

The American Society of Civil Engineers holds its regular meetings on the first and third Wednesday in each month, at the House of the Society, 127 East Twenty-third street, New York.

The Boston Society of Civil Engineers holds its regular meetings at the American House, Boston, at 7:30 p. m., on the third Wednesday in each month.

The Western Society of Engineers holds its regular meetings at 78 La Salle street, Chicago, at 8 p. m., on the first Wednesday in each month.

The Engineers' Club of St. Louis holds regular meetings in the club's room, Laclede Building, corner Fourth and Olive streets, St. Louis, on the first and third Wednesdays in each month.

The Engineers' Club of Philadelphia holds regular meetings at the House of the Club, 1122 Girard street, Philadelphia, on the first and third Saturday of each month, excepting in January, when the annual meeting is held on the second Saturday of the month. The second January meeting is held on the third Saturday. The club stands adjourned during the months of July, August and September.

The Engineers' Society of Western Pennsylvania holds regular meetings on the third Tuesday in each month, at 7:30 p. m., at its rooms in the Penn Building, Pittsburgh, Pa.

The Engineers' Club of Cincinnati holds its regular meetings at 8 p. m. on the third Thursday of each month in the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati.

The Civil Engineers' Club of Cleveland holds regular meetings on the second Tuesday of each month, at 8:00 p. m., in the Case Library Building, Cleveland. Semi-monthly meetings are held on the fourth Tuesday of the month.

The Engineers' Club of Kansas City meets in Room 200, Baird Building, Kansas City, Mo., on the second Monday in each month.

The Engineering Association of the Southwest generally holds its meetings at the Association headquarters, Nos. 63 and 64 Baxter Court, Nashville, Tenn.

The Denver Society of Civil Engineers and Architects holds regular meetings at 38 Jacobson Block, Denver, on the second and fourth Tuesday of each month, at 8 o'clock p. m., except during June, July and August, when they are held on the second Tuesday only.

The Civil Engineers' Society of St. Paul meets at St. Paul, Minn., on the first Monday in each month.

The Montana Society of Civil Engineers meets at Helena, Mont., at 7:30 p. m., on the third Saturday in each month.

The Civil Engineers' Association of Kansas holds regular meetings at Wichita on the second Wednesday of each month, at 7:30 p. m.

The American Society of Swedish Engineers holds meetings at the club house, 250 Union street, Brooklyn, N. Y., and at 347 North Ninth street, Philadelphia, on the first Saturday of each month.

Montana Society of Civil Engineers.
The regular monthly meeting was held in Helena, Dec. 30, Mr. W. A. Haven, presiding. Nine members and one visitor were present. The secretary read the report of the committee appointed to nominate officers of the society for the ensuing year. Mr. J. S. Keerl made a verbal report that Mr. Elliott H. Wilson, of Butte, had been selected a representative of the Society to serve on the permanent committee upon an International Engineering Congress at Chicago in 1893. The committee of arrangements for the annual meeting stated that the first day would be spent at Marysville at the invitation of Mr. R. T. Bayliss, Manager of the Montana Company, when an inspection of the mines and works of that company will be made. In the evening after the return from Marysville the annual meeting will be held, and later on a banquet had at the hotel Helena.

A memoir of Maj. Benjamin H. Green, late President of the Society, prepared by the special committee, was read by Mr. J. S. Keerl, the Chairman. It was voted to have it printed in the *Journal*.

A paper by Mr. S. J. Jones on the "Arithmometer," was read by Mr. Finlay McRae, who demonstrated the advantages resulting from its use upon certain classes of calculations, on a machine loaned by Gen. George O. Eaton, Surveyor General for Montana. The machine is of French invention, and is capable of multiplying 16 figures in the multiplicand by eight figures in the multiplier, and performing division with equal facility. It has been in constant use in the Mineral Department of the United States Surveyor General's office for Montana, for over four years, mainly upon traverse calculations, and accomplishes results in much less time than is practicable by the use of logarithmic or transverse tables.

National Convention of Railroad Commissioners.
The undersigned designate the 3d day of March, 1891, at 11 o'clock in the forenoon as the time, and the office of the Interstate Commerce Commission, in the city of Washington, D. C., as the place for the holding of a National Convention of Railroad Commissioners.

The Railroad Commissioners of all the states, and any state officers charged with any duty in the supervision of railroads or railroad interests, are respectfully requested to attend. The American Association of Railway Accounting Officers is also invited to meet with the Commissioners, or to send delegates to the convention, for the discussion of such questions of special interest to their association as may arise at the meeting.

The undersigned respectfully suggest the following as subjects which may usefully be considered by the convention:

Railway Legislation: How harmony therein may be attained.

Uniformity in Railway Accounting: What further is important to that end.

Territorial Assignment of Statistics of Operation: Whether this is not practicable, and what principles should control in grouping railway statistics.

Apportionment of Expenses to Freight and Passenger Traffic: What reasons there are for making such an apportionment, and what rules should be adopted.

Safety Appliances for Railroad Cars: What legislation, if any, should be had by Congress.

Reasonable Rates: What are, and the elements to be considered in the determination thereof.

In offering these suggestions it is not intended that they shall be understood as excluding any other topics affecting state and interstate commerce which could properly come before and be entertained by such a convention.

THOMAS M. COOLEY, Chairman,
E. W. KINSLEY, of Massachusetts,
I. A. SPALDING, of Kentucky,
D. P. DUNCAN, of South Carolina,
J. P. WILLIAMS, of Minnesota, } Committee.

New England Railroad Club.
The regular meeting of the club will be held at the United States Hotel, Boston, Wednesday, Jan. 14, 1891, at 7:30 p. m. The subject for discussion is: "What Constitutes a Defect in a Vertical Face Coupler Sufficient to Condemn the Coupler?"

New York Railroad Club.
A regular meeting will be held at the rooms of the Club, 28 West Thirtieth street (Gilsey House), New York, Thursday, Jan. 15, at 2 o'clock p. m. Subjects: "Qualities Essential for a Free Steaming Locomotive," by A. E. Mitchell, Mechanical Engineer, New York, Lake Erie & Western; "Car Service," by W. G. Watson, Division Superintendent, West Shore. Members are expected to bring friends who may be interested in these subjects.

Engineers' Club of Cincinnati.
The annual meeting of the club, held on the evening of the 18th ult., being the third since its organization, was well attended.

Two applications for membership were received and Thos. K. Kennedy, City Engineer of Newport, Ky., and Claude Freeman, mechanical engineer, were elected to membership.

The annual report of the Secretary showed the average attendance during the year to be 25; total membership at date, 96.

A paper was read at each meeting, and on one night six short papers. The club lost one member during

the year by death, five by resignation, and five were dropped from the rolls.

The following officers were elected for the coming year: President, Robert L. Read; Vice-President, Ward Baldwin; Directors, Epes Randolph, W. B. Ruggles and S. Whinery; Secretary and Treasurer, J. F. Wilson.

The retiring President, Mr. G. B. Nicholson, made a very interesting address in which he reviewed the history of the club and its progress since organization. He urged the desirability of procuring permanent quarters and the establishment of a library. His address concluded with a short description of the works of engineering interest in and about Cincinnati.

The Southern & Southwestern Railway Club.

The next meeting of the club will be held at the Kimball House, Atlanta, Ga., on Thursday, Jan. 15, at 10 o'clock a. m. The subjects for discussion are: "Rigid vs. Swing Motion Trucks," to be opened by A. G. Steinbrenner, M. C. B., American Refrigerator Transportation Co., and "Relative Merits of Brakes Hung to the Body of the Cars and those Hung to the Trucks," to be opened by P. Leeds, Superintendent Motive Power, Louisville & Nashville.

PERSONAL.

—Mr. John H. Gray, General Manager of the Texas Western, has tendered his resignation. He proposes to engage in other business.

—Mr. Stanley Mansfield, formerly Manager of the Nashua, Acton & Boston road, died last week at his home in Lowell, Mass., aged 61 years.

—Mr. L. K. Lodge, Superintendent of the Altoona Division of the Pennsylvania Railroad, died Dec. 31 of typhoid pneumonia at his home in Altoona.

—R. H. Hood, formerly Superintendent and Engineer of the Davis Coal & Coke Co., of Piedmont, W. Va., has been appointed Chief Engineer of the Seaboard Air Line, with headquarters at Raleigh, N. C.

—Mr. R. B. Williams, for a long time trainmaster on the West Shore at Weehawken, N. J., has been appointed Superintendent of the Western and Springfield divisions of the New York & New England.

—Mr. Lucius Smith, for several years Assistant General Freight Agent of the West Shore, was this week appointed Eastbound Freight Agent of the road and of the fast freight lines operating over it. The position has just been created.

—Mr. R. E. Eavenson, recently appointed Superintendent of Transportation of the New York & New England, and formerly Superintendent of the Eastern Division, has resigned. The position has been abolished, and the duties will be under the supervision of the General Superintendent.

—Mr. M. H. Rogers, who as Resident Engineer has had charge of the engineering department of the Denver & Rio Grande for the last year has been appointed Chief Engineer. The position was abolished on the resignation of Mr. R. E. Briggs in November, 1889. At that time Mr. Rogers' title was changed from Division Engineer to Resident Engineer.

—Mr. William Wainwright, Assistant Manager of the Grand Trunk, since 1883, and the General Manager of the North Shore road, has been appointed Assistant General Manager of the former system. It is understood that no successor will be appointed to Mr. L. J. Seargent as Traffic Manager, and that the duties of the position will be attended to by Mr. Wainwright.

—Mr. Charles N. Yeamans, Superintendent of the Northampton Division of the New York, New Haven & Hartford, has resigned. He is also President of the road constituting the division (the New Haven & Northampton, leased to the New York, New Haven & Hartford), and this office he retains. Mr. Yeamans has had charge of this road for 31 years, having succeeded his father as Superintendent in 1859. Mr. R. G. Curtiss, who has been Mr. Yeaman's assistant for many years, takes the place vacated by the latter.

—Mr. Dudley Farlin has resigned as General Freight Agent of the railroad department of the Delaware & Hudson Canal Co. The step was taken on account of increasing private interests. He is President of the Lima Oil Co., and of a Virginia mining company, and he is also interested in various gas and electric light companies. Mr. Farlin's service with the Delaware & Hudson Canal Co. extends over a period of 15 years. He was previously a clerk in the freight departments of the Ohio & Mississippi and New York & Oswego Midland.

Mr. H. W. McNeil has resigned all connection with the Oregon Improvement Co. He will spend several months in the East and will then return to Seattle to enter the service of the Coast Commercial Co. His title will probably be Manager. Mr. McNeil has been General Manager of the Oregon Improvement Co. for the last year or two, while the Seattle & Northern and Port Townsend Southern roads were building. He resigned last July, but as the possibility of a receivership was foreshadowed as early as that date he was asked to remain with the company until some of the questions arising from such a necessity could be cleared up.

—Mr. A. M. Tucker, General Superintendent of the New York, Pennsylvania & Ohio, has been appointed General Manager of that road and of the Chicago & Erie. Several other changes have been made in the operating department of the Erie line. Mr. J. H. Barrett, Superintendent of Transportation of the Erie Division for the last two years, and previously Superintendent of the Eastern division, has been appointed General Superintendent of the road to succeed Mr. W. J. Murphy. The position has been vacant since last March. Mr. Barrett's successor as Superintendent of Transportation is Mr. W. H. Starr, formerly Superintendent of the Delaware Division, but for several months past Assistant Superintendent of Transportation. Mr. J. C. Moorhead, Superintendent of Transportation of the Chicago & Erie and New York, Pennsylvania & Ohio, has been appointed General Superintendent of both roads to succeed Mr. A. M. Tucker, now General Manager.

—A partial reorganization of the Union Pacific plan of operation has been made. Five grand divisions are established. The St. Joseph & Grand Island division is abolished, and its territory added to the Kansas Division. Robert Blickensderfer has been appointed Acting General Superintendent of the Nebraska Division. J. O. Brinkerhoff becomes General Superintendent of the Kansas Division; R. J. Duncan General Superintendent

of the Gulf Division; W. H. Bancroft General Superintendent of the Mountain Division, and E. McNeill General Superintendent of the Pacific Division. The principal alteration made is the change of the titles of the heads of the divisions from general manager to general superintendent. Mr. W. P. Robinson, Jr., was General Manager of the St. Joseph & Grand Island. Mr. J. O. Brinkerhoff has been General Manager of the Missouri River Division; Mr. R. Blickensderfer has been Superintendent of the Nebraska Division; Mr. R. J. Duncan has been Superintendent of the Colorado Division of the Gulf Division, and succeeds Mr. Channing F. Meek as General Manager; Mr. W. H. Bancroft was formerly General Superintendent of the Rio Grande Western and succeeds Mr. C. F. Rensselaire. Mr. McNeill has been General Manager of the Pacific Division, and was formerly General Manager of the St. Joseph & Grand Island.

—Colonel W. H. Paine, of New York, died suddenly at Cleveland, O., on Dec. 31. His illness was the direct result of a slight cold. He had been engaged since August, 1889, superintending the construction of the cable plant for the Cleveland City Cable Co. Colonel Paine was born in Chester, N. H., in 1828. His first employment was as a land surveyor in Wisconsin. From there he went to California, where he engaged in mining enterprises. In 1849 he surveyed a wagon road across the Rockies, and in 1853 had charge of a party that surveyed a route for a Pacific railroad from Sacramento to Utah. He took part in raising several regiments of Wisconsin troops during the war of the rebellion, and accompanied the Fourth Wisconsin to Washington. He entered the Engineer Corps, where his training and experience immediately made him a prominent and successful officer. Colonel Paine here did valuable work, and was more than once personally thanked by President Lincoln for the valuable information he obtained. Among this was the dimensions of all the railroad bridges between Washington and Richmond. The material for this construction was made from drawings secured by Colonel Paine. He was appointed captain on the staff of General McDowell. He was afterward promoted to a colonelcy and served on the staff of the Major-General commanding to the end of the war. He made many valuable military maps during and after the war. At the close of the war Colonel Paine resumed the practice of his profession, and in 1869 he was chosen one of the engineers of the Brooklyn Bridge. He assisted John A. Roebling in making the original surveys, superintended the building, placing and sinking of the caissons, built the New York tower, and was in charge of the laying of the superstructure and the regulating of the cable wires. He invented the grip in use on the cars and planned the whole system of cable traction on the bridge. He remained with the bridge as Assistant Engineer for some years and then resigned to practice as consulting engineer in connection with cable railroad enterprises. He was a prominent member of the American Society of Civil Engineers.

ELECTIONS AND APPOINTMENTS.

Beech Creek.—The New York Central & Hudson road, having leased the Beech Creek road, will hereafter operate it as lessee. J. D. Layng will have charge of the operations of the road as General Manager for the lessee, as previously announced.

Boothbay Harbor.—The directors of this proposed Maine road have elected these officers: President, Thomas Boyd; Treasurer, C. H. Fisher; Secretary, G. B. Kenniston, all of Boothbay Harbor, Me. H. A. Hancock, No. 12 Pearl street, Boston, is Chief Engineer.

Boston & Albany.—Everett E. Stone has been appointed Road Master of the second Division, from Worcester to Springfield, Mass., and branches, in place of P. M. Butler, deceased. Royal A. McQuade has been appointed Assistant Road Master of the Second Division in place of E. E. Stone, promoted.

Boston & Lowell.—At the annual meeting in Boston, Jan. 7, the following Board of Directors was re-elected: T. Jefferson Coolidge, W. Powell Mason, Edwin Morey, Frederick E. Clarke, William A. Haskell, Francis L. Higginson, and George A. Gardner.

Brooklyn-Union (Elevated).—At the annual meeting of the road in Brooklyn, N. Y., Jan. 7, the following board of directors was re-elected: Henry W. Putnam, Henry W. Putnam, Jr., Frederick Uhlmann, Simon Uhlmann, Edward Lauterbach, Hugo Rothschild, Edward Snedeker, Isaac Lewis, A. J. Hardenbergh, Adolf Ladenburg, Anthony Barrett, George W. Wingate and Reuben T. Pollard. The directors re-elected Henry W. Putnam, President; Elbert Snedeker, Vice-President, and Hugo Rothschild, Treasurer.

Canadian Pacific.—That portion of the Ontario & Atlantic Division west of and including Megantic is now known as the Ontario & Quebec Division. The section between Megantic and Vanceboro will be added to the New Brunswick Division; and the united lines of the company east of Megantic will be known as the Atlantic Division. Thomas Tait will be General Superintendent of the Ontario & Quebec Division, with office at Toronto. H. P. Timmerman will be General Superintendent of the Atlantic Division, with office at St. John, N. B.

Central of Georgia.—All the old board of directors were re-elected at the annual meeting in Savannah, Ga., Jan. 5, except that for Judge Chisholm Col. Uriah Harrold, of Americus, was substituted. The Richmond Terminal voted 42,000 shares. The board stands: E. P. Alexander, J. K. Garnett, E. M. Green, Absalom Veburg, James Hull, C. H. Phinzy, Patrick Calhoun, John C. Calhoun, S. M. Inman, H. T. Inman, E. P. Howell, James Swan, U. B. Harrold. Gen. Alexander was re-elected President.

The freight traffic of the Erie lines will hereafter be conducted in two departments, the first covering the lines east of Buffalo and Salamanca, and the second the lines west of Buffalo and Salamanca, including the Buffalo & Southwestern and the Chicago & Erie. The head of each department is instructed to report direct to the Second Vice-President. The officers in each department are as follows: East of Buffalo and Salamanca: F. L. Pomeroy, General Freight Agent, New York, in charge of freight traffic except coal; J. Deuel, Assistant General Freight Agent, Buffalo; H. B. Chamberlain, Assistant General Freight Agent, New York. West of Buffalo and Salamanca: George G. Cochran, Western Freight Traffic Manager, Chicago, Ill., in charge of all freight traffic; S. P. Shane, General Freight Agent, New York, Pennsylvania & Ohio, Cleveland, O.; C. L. Thomas, Assistant Freight Agent Chicago & Erie, Chicago, Ill.

Chicago, Burlington & Quincy.—J. F. Deems has been appointed Master Mechanic of the Middle Iowa Division, vice E. Jones, transferred to be Master Mechanic of the West Iowa Division, succeeding P. Wallis, resigned.

Chicago & Eastern Illinois.—The following official changes have been made: T. W. Burrows, having resigned as Superintendent of Transportation to engage in other business, M. S. Connors has been appointed Superintendent, with headquarters at Danville, Ill. C. J. Clifford, Acting General Master Mechanic, appointed General Master Mechanic, with headquarters at Danville. He will have charge of the motive power and machinery department. A. A. Bowman, Acting Trainmaster, with headquarters at Danville.

F. V. Davis having resigned to accept service with another company, the position of Freight Traffic Manager has been abolished. The duties heretofore developing upon the Freight Traffic Manager will be performed by L. Rush Brockenbrough, General Freight Agent. George H. Prescott has been appointed Traveling Freight Agent, vice J. W. Barrington transferred.

Chicago & Erie.—E. B. Thomas has been elected First Vice-President to succeed S. M. Felton, resigned. Mr. Thomas will have general supervision over the affairs of the company. George H. Vaillant has been elected Second Vice-President of this company, in charge of the freight and passenger traffic. The following appointments have been made: A. M. Tucker, General Manager; J. C. Moorhead, General Superintendent, with office at Cleveland, O.; W. F. Turrell, Assistant-Superintendent of Motive Power, with headquarters at Cleveland, and A. M. Mozier, Superintendent of Transportation, with office at Cleveland.

Cincinnati, Hamilton & Dayton.—Alexander Galloway has been appointed Superintendent of the Cincinnati, Hamilton & Indianapolis Division of this railroad. Superintendent Husted, of that division, has been transferred to the Dayton & Michigan Division, vice M. Mounts, who resigned to accept the General Superintendency of the Pacific & Pekin Union.

Cleveland & Pittsburgh.—The annual meeting of the stockholders was held in Cleveland this week. The following directors were elected for the ensuing year: J. N. McCullough, B. F. Jones, Pittsburgh; George B. Roberts, Philadelphia; Charles Lanier, William C. Eggleston, New York; E. A. Ferguson, Cincinnati; J. V. Painter, E. R. Perkins, R. P. Ranney, R. F. Smith, and M. A. Hanna, Cleveland; and W. W. Holloway, Bridgeport, Ohio.

Columbus & Xenia.—The stockholders of the company elected the following directors at a meeting in Columbus, O., Jan. 1: P. W. Huntington, R. A. Harrison, George M. Parsons, John W. Andrews, Robert S. Smith, James A. Swan, W. B. Hayden, Rutherford H. Platt, B. F. Martin, Henry Hanna, Alfred Thomas and Thomas D. Messler. The directors organized by choosing P. W. Huntington President and Robert S. Smith Secretary and Treasurer.

Concord & Montreal.—George W. Storer has been appointed Assistant General Passenger Agent of the road. The office of New England Passenger Agent has been abolished.

Delaware & Hudson Canal.—Dudley Farlin having resigned as General Freight Agent of this company all communications to the General Freight Department may be sent to Paul Wadsworth, Assistant General Freight Agent, until further notice.

Denver & Rio Grande.—M. H. Rogers has been appointed Chief Engineer of the road, with headquarters in Denver, Colo.

Fitchburg.—E. A. Smith has been appointed Superintendent of telegraph, with office at Boston. He will continue as Chief Train Dispatcher of the Fitchburg, Western & Tunnel divisions, the office of the last named division having been moved to Fitchburg, Mass.

Gulf, Colorado & Santa Fe.—T. M. Bisbee has been appointed General Road Master of the Northern division, in charge of maintenance of way, bridges, buildings and water service departments. His headquarters will be at Cleburne, Tex.

Kentucky Central.—The following directors were elected this week to represent the Louisville & Nashville: Milton H. Smith, J. D. Probst, William Mertens, J. A. Horsey, Thomas Rutter and Eckstein Norton. The board subsequently elected Mr. Smith President; H. E. Huntington, Vice-President, and A. W. Morris, Treasurer and Secretary.

Minneapolis & St. Louis.—W. H. Whitaker, Acting Master Mechanic, has been appointed Master Mechanic.

Mokawick & St. Lawrence.—The following Directors have been elected by this New York Central extension Co.: Walter Webb, John M. Tousey, Theodore Voorhees, Walter Katté, Charles M. Boncell, Frank A. Harrington, Walter Katté, Edward V. W. Rossiter, Thomas L. James, John R. Van Wormer, John B. Dutcher, Frank Loomis, William J. Van Arsdale and Ira A. Place. The Directors have elected Walter Webb as President, E. V. W. Rossiter as Treasurer and Ira A. Place as Secretary.

New York, Lake Erie & Western.—A. M. Tucker has been appointed General Manager of the Chicago & Erie and the New York, Pennsylvania & Ohio division, with office at Cleveland, O. W. F. Turrell has been appointed Assistant Superintendent of Motive Power of the New York, Pennsylvania & Ohio division, with office at Cleveland. J. H. Barrett, Superintendent of Transportation, has been appointed General Superintendent of the Erie division, with office at Jersey City, N. J. J. C. Moorhead, Superintendent of Transportation, has been appointed General Superintendent of the New York, Pennsylvania & Ohio division, with office at Cleveland. A. M. Mozier has been appointed Superintendent of Transportation, vice J. C. Moorhead. W. H. Starr has been appointed Superintendent of Transportation of the Erie Division, with office at Jersey City. H. N. Donaldson, Acting Superintendent of the Mahoning Division, has been appointed Superintendent of the Western Division of the New York, Pennsylvania & Ohio, with office at Galion, O., vice A. M. Mozier, promoted.

New York & New England.—The resignation of R. E. Eavenson, Superintendent of Transportation, having been tendered, that office has been abolished. The duties assigned to the Superintendent of Transportation will be attended to in the General Superintendent's office at Boston. R. B. Williams, formerly a Trainmaster of the West Shore, has been appointed Superin-

tendent of the Western Division, with headquarters at Hartford.

New York, New Haven & Hartford.—R. C. Curtiss has been appointed Superintendent of the Northampton division, with office at New Haven, Conn.

Norfolk & Western.—The traffic department has issued a notice dated Jan. 1, announcing that in accordance with the revised organization of the company, the officers of the department will be as follows: A. Pope, General Freight Agent; O. Howard Royer, Assistant General Freight Agent; W. B. Beville, General Passenger Agent; A. F. Ravenel, Jr., Freight Claim Agent; W. E. Mingea, Division Freight Agent, Eastern General Division; Chas. E. Finch, Division Freight Agent, Western General Division, all with offices at Roanoke, Va.; J. J. Archer, Division Freight and Passenger Agent, Scioto Valley and Kenova Sub-Divisions, office at Columbus, O.; W. T. Payne, Foreign Freight Agent, office at Norfolk, Va.; Thomas Pinckney, General Eastern Agent, Virginia, Tennessee & Georgia Air Line, and L. J. Ellis, Eastern Passenger Agent, both with office at 303 Broadway, New York.

St. Louis, Arkansas & Texas.—R. S. Davis, General Agent at Cincinnati, O., has been appointed Assistant General Freight Agent of that road. H. B. Miller, of the Little Rock & Memphis, has been appointed General Agent, with headquarters at Memphis.

South Atlantic & Ohio.—D. H. Conklin has been appointed General Superintendent of this company, succeeding H. W. Bates, resigned. The office of general manager, which he held, has been abolished. The office of general superintendent is at Bristol, Tenn.

Tennessee Coal, Iron & Railroad.—At a meeting in New York last week several new officers were elected. W. M. Duncan, of Nashville, Tenn., First Vice-President, resigned, and N. Baxter, Jr., of Nashville, was elected to the office. Second Vice-President Jackson, of Birmingham, Ala., also resigned and was succeeded by T. T. Hillman, of the same city. Messrs. Baxter and Hillman are to have charge of the company's operations. The following new directors were elected: John H. Inman, New York; N. Baxter, Jr., Nashville; T. T. Hillman, Birmingham; H. O. Armour and Gen. Samuel Thomas, of New York.

Terre Haute & Peoria.—John H. Sessions has been appointed the successor of A. Stevens as General Passenger and Freight Agent of the road, with office at Decatur, Ill.

West Shore.—Lucius Smith has been appointed East-bound Freight Agent for the road and all of its fast freight lines, with office at No. 100 Wall street, New York City. Francis La Bau has been appointed Assistant General Freight Agent of the West Shore and Walkill Valley roads, with office at No. 5 Vanderbilt avenue, New York, vice Lucius Smith, transferred.

White River.—The following are the officers of the company: E. M. Goss, President; Andrew Opdahl, Vice-President; G. A. Mitchell, Secretary and Treasurer; C. W. Joynt, General Manager, all of Buckley, Wash., and W. R. Wood, Chief Engineer, Sumner, Wash.

RAILROAD CONSTRUCTION, Incorporations, Surveys, Etc.

Alberta.—This company is applying to the Dominion parliament for power to construct an extension of its line through the Crow's Nest Pass to a point on the Canadian Pacific in British Columbia. The Crow's Nest Pass & Kootenay Lake is also applying for powers to build a connecting line.

Annapolis Atlantic.—This company has been chartered to build a road from Annapolis, Nova Scotia, to Liverpool and Shelburne, Nova Scotia. Subsidies have been voted to aid in its construction by the governments of Canada and of Nova Scotia. The line will extend through a well-developed country, and will reach several gold mines, which it is reported are being profitably worked. The president, R. G. Henry, of Brockville, Ont., has been authorized to award the contracts. James Irvine, of New York, is Vice-President.

Berryville & Summit Point.—The road has been incorporated in West Virginia. It will build from a point on the Winchester & Potomac road, at Summit Point, Jefferson County, to a point in Clark County, Va., near Berryville. The principal office is to be at Summit Point. The capital stock is \$50,000.

Boothbay Harbor.—The surveys and plans of this line have been handed over to the Maine Central for examination. If the company decides not to undertake the construction of the line the projectors claim that they will build under the charter in the spring. The survey has been made from Boothbay Harbor to Newcastle, Me., on the Penobscot Shore Line, which is controlled by the Maine Central. The distance is 15 miles. Thomas Boyd, Boothbay Harbor, is president, and H. A. Hancock, Hudson, Miss., is chief engineer.

Bluefield & Princeton.—H. S. Hambers, the engineer in charge, has completed the survey of the line between Bluefield and Princeton, W. Va., and is ready to commence grading. This work will be completed early in the spring. The surveys include an extension of the originally proposed line from Bluefield to Hinton, Summers County, where it will connect with the Chesapeake & Ohio.

Buffalo & Geneva.—Work on this Lehigh Valley extension to Buffalo has been practically suspended for the season, although everything possible is being done with the grading. The work on the masonry was suspended about a week ago, and will not be resumed before the opening of spring. The company has been seriously delayed by bad weather during the year, but if next season is at all favorable it will be able to complete the road by the time expected, May 1, 1892.

Buffalo, Lake Erie & Battleford.—This company is applying to the Dominion Parliament for an act of incorporation giving power to construct a road from the Calgary and Edmonton line in Alberta, easterly to the Red Deer River, and northeasterly to Battleford; also with powers to acquire lands for coal, iron and other mines, and to work the mines.

British Columbia.—Application is being made to the Dominion Parliament for an act to incorporate a company to construct a line from Spence's Bridge, on the Canadian Pacific, in British Columbia, southeasterly, following the valley of the Nicola River to the western end of Nicola Lake, with a branch commencing at the junction of Coldwater and Nicola rivers, southerly

along the valley of the Coldwater River to its junction with the Voght River.

Burnside & Cumberland.—This road was opened for traffic last week. It is a short line, and was built by C. W. Cole, M. F. Malloy and others of Cincinnati, from Burnside, Ky., on the Cincinnati Southern, to the Burnside Landing of the Burnside & Burkesville Transportation Co.

Chattanooga Southern.—The work on the tunnel at Pigeon Mountain, and for one mile adjoining it, in Walker County, Ga., will delay the opening of the road for a considerable period. It is about the only work now uncompleted. The tunnel is 600 ft. long. The road is now graded from Chattanooga southwest to Gadsden, Ala., 92 miles. Six miles of the road at Chattanooga is a leased line. All the work except three miles graded in 1889 was built last year. The track was laid on this three miles in 1889, but about 45 miles was laid in 1890. The first 22 miles from Chattanooga to Kensington, Ga., has been ballasted and is being operated.

Chicago, St. Paul & Kansas City.—The train service over this road to Mason City, Ia., was discontinued Jan. 6. Since February the road has been using the Iowa Central track from Manly to Mason City, but owing to a disagreement between the two roads the Kansas City refuses to longer operate it. It is rumored that in a short time the latter will build an independent line to Mason City, a distance of nine miles, to connect with the Winona & Southwestern or the Mason City & Fort Dodge.

Cleveland, Cincinnati, Chicago & St. Louis.—The project to build a cut-off, shortening the line between Indianapolis and Chicago, is taking definite shape. A press dispatch says that a line has been surveyed from the main line at Stockwell and joins it again at Templeton. The distance between these points by the present line, the road using the Lake Erie & Western from Lafayette to Templeton, is 30 miles; by the cut-off it would be but 28 miles.

Cobourg, Northumberland & Pacific.—The surveys have been in progress in Ontario for this road for some weeks. It is to extend from Cobourg, Ont., to a point on the Ontario & Quebec division of the Canadian Pacific near the Central Ontario junction. The line will be about 50 miles long. The enterprise is aided by both the Dominion Government and the municipalities en route. The projectors state that they will place a considerable portion of the line under construction during the summer of 1891. Henry W. Wickstead is Chief Engineer.

Delaware, Susquehanna & Schuylkill.—The first six miles of this road has been finished from Eckley to Stockton, Pa. The road now under construction is from Drifton to Gowen, Pa., nine miles, and branches to Beaver Meadows and Oneida, and other points, a distance of 13 miles altogether. The total distance between Drifton and Gowen is 20 miles, and that part of the line will doubtless be built this year. Brown Brothers & Co., of Hazleton, Pa., are the contractors.

Fort Worth & Rio Grande.—The contract has been let for the extension from Comanche, Tex., southwest for some distance to the Llano river mines.

Georgia, Carolina & Northern.—One of the engineers states that trains will be running to Athens, Ga., by March. The trains already come to the Savannah River, and the roadbed is very nearly all graded from the river to Athens, ready for the tracks. Regular schedules are now run from Norfolk to Abbeville, and will soon be running to Elberton. There has been some little delay about entering Georgia because of the amount of work necessary to bridge the Savannah River. But the iron bridge has at last been constructed, and the track has been laid across it. The structure cost \$100,000. The bridge over Broad River, between Elberton and Athens, is ready for the track, and the workmen are rapidly getting in shape the great bridge over the Oconee at Athens, which is the highest span along the road. Grading is now being rapidly pushed from Lawrenceville to Atlanta, and in a short time trains will be running over the entire line.

Grand Trunk.—The contract recently let to Sinclair & Doheny, of North Stratford, N. H., for building a second track is for only part of the work between Belleville and Port Hope, Ont. Their contract is for 36 miles between these two points. The section of which it is part, begins at Trenton, just west of Belleville, and extends westerly to Scarboro, nine miles east of Toronto. One other section on the line between Montreal and Toronto, is a single track. This is from Napanee east to Gananoque, 43 miles and the contract for building the second track has been let. It will be built before the line west of Belleville. Forty-four miles of second track was laid in 1890, between Montreal and Toronto, on two lines of even length. One is from Wales, west of Cornwall to Iroquois, Ont., and the second from Napanee to Belleville. McArthur Bros. of Belleville, were the contractors.

The Waterloo Junction road now being built from Waterloo North to Elmira, Ont., 10½ miles, is an extension of the Galt and Waterloo branch of this road, and it will be operated by the Grand Trunk when completed. J. C. Boyd, of Simcoe, Ont., the contractor, has about 80 men on the grading, but this force is to be gradually increased. The maximum grade is 52 ft. per mile. A large iron bridge will be built near St. Jacobs over the Cnestog River. The span will be 150 ft., and the iron trestle 300 ft. long. A survey has been made for a further extension from Elmira to Drayton, a distance of 15 miles. C. H. Chapman, of Waterloo, is engineer in charge.

The engineers who have been engaged for the past three months in surveying an extension of the Great Western Air Line division to the St. Clair tunnel have about completed the work. The line begins on the Great Western division at Glencoe, extending northwesterly to a point near Sarnia, Ont., on the Sarnia branch of the Great Western. The object is to connect the former line with the St. Clair tunnel on the latter, so that through freight can be carried to Buffalo without passing through the crowded yards of London and Hamilton. It will also greatly relieve the main line of the Great Western generally.

Lake Shore & Michigan Southern.—The company has made a new proposition to the people of La Grange and Steuben counties, Ind., to the effect that the company will build the proposed road from Fayette, O., to Goshen, Ind., passing through Angola and La Grange, if the people will give right of way and depot grounds.

Los Angeles Terminal.—The company has completed all the levee work prescribed by the city of Los Angeles, Cal., and has withdrawn for the winter the force that has been engaged on it. Early in the spring the grad-

ing will be resumed on the extension to San Pedro, 20 miles, and it will be built as fast as possible.

Mexican Roads.—Arthur C. Field, of San Jose, Cal., states that he has obtained a valuable railroad franchise from the government of Durango, which gives him a subvention of \$13,000 per mile, free right of way and depot grounds. The road will extend from the city of Durango to Zacatecas, a distance of 200 miles, at the latter place making a junction with the Mexican Central.

Montgomery, Tuscaloosa & Memphis.—Out of the 106 miles of this road from Montgomery to Tuscaloosa, Ala., about 70 has been graded and the remaining 36 miles is under headway, all the contracts being sub-let. Trestling from Montgomery to the Alabama River is completed and the superstructure for the Alabama River bridge is about completed at the shops of the Phoenix Bridge Co., at Phenixville.

New Roads.—The Canadian Parliament will incorporate a company to construct a road from a point on the Mission branch of the Canadian Pacific in British Columbia to a point in the municipality of Chilliwack.

Ogdensburg Terminal.—The company has filed a certificate with the Secretary of State in Albany, N. Y., in increasing its capital stock from \$200,000 to \$400,000.

Pittsburgh, Shenango & Lake Erie.—The extension of this road to Lake Erie has been completed from Osgood, on the Lake Shore & Michigan Southern, north 20 miles to near Dicksonburg. A connection with the New York, Chicago & St. Louis will be made at a point about one mile northeast of Girard. The extension of the road beyond Dicksonburg will be delayed for some time, but will probably be completed to one of the ports on Lake Erie in a few months. The company has made many improvements at Conneaut harbor, but Erie is now favored as the lake terminus. If the road can be built into that town at a small expense for right of way it will be made the terminus. In that case a branch may be built to Conneaut, so that the expenditures at that point may not be wholly useless.

Potomac Valley.—The company has just executed a mortgage to the Mercantile Trust & Deposit Co., of Baltimore, for \$2,000,000, covering the road from Williamsport to Cherry Run and its Pennsylvania extension from Porter's Station on the Western Maryland to Chickies on the Susquehanna River, and from Abbottstown, also on the Western Maryland, to Bowmansdale on the Harrisburg and Potomac. Arrangements have been made for placing the issue. Each of the extensions named will cost about \$400,000, including the construction of bridges over the Susquehanna at Chickies and across the Potomac at Cherry Run. The surveys for the new road have been completed, and work will begin in the early spring.

St. Louis & Hannibal.—The proposed branch to the Wabash road, is not likely to be put under contract for some time. It has been contemplated by the officers, but the matter has not assumed a very definite shape. If it is built the line would be in the form of a branch from a point on the present line near New London, Mo., to a point on the Wabash east of Moberly, yet to be determined.

Seattle, Lake Shore & Eastern.—A year ago the track on the northern branch had been laid to a point 24 miles north of Snohomish Junction, Wash. The latter point is 37 miles north of Seattle. The final location had been made in a northerly direction from the end of the track through an entirely new country, to the international boundary at a point ten miles south of Mission, B. C., on the Canadian Pacific, a distance of 78 miles. During the past year the northern branch has been graded, and the tracklaying and bridging completed to a point 79 miles north of Snohomish Junction. All the contracts have been completed, except that of the San Francisco Bridge Co., of San Francisco, Cal., and Seattle, Wash., for the tracklaying and bridging. The uncompleted portion of the road, the last 23 miles, is through the Nooksack River valley, with easy curves and light grades. About 120 men are now employed on the bridging. The principal bridges are: Stillaguamish River crossing, a 240 ft. draw span and pile approaches, aggregating 4,200 ft.; the Pilechuck Creek crossing, a 100 ft. Howe truss deck span and trestle approaches, aggregating 1,500 ft.; Skagit River crossing, 250 ft., a Howe truss draw span and two 200 ft. combination spans, with pile approaches, aggregating 7,900 ft.; at south fork of Nooksack River, 200 ft. combination span and pile trestle approaches, aggregating 2,200 ft.; north fork of Nooksack River crossing, two 160 ft. combination spans, one 100 ft. Howe truss span and pile trestle approaches, aggregating 2,600 ft. The work of construction has been done by the Seattle & Eastern Construction Co. through sub-contractors.

Henry & Balch, contractors of the Lake Washington Belt Line at Seattle have, it is understood, secured the contract for the extension of this road from Sallal Prairie, the present terminus, to the Denny iron mines.

South Brunswick Terminal.—This road, which is built from Brunswick, Ga., will be put in operation by Jan. 15, and will also be extended. This property has been standing idle ever since a short time after its completion, and was put in the hands of a receiver, but the bondholders, represented by Judge H. R. Steele and Henry Redmond, of New York, have satisfied all other claims preparatory to taking control of the property and working it.

Tillamook Railway & Navigation Co.—This is a recently chartered Oregon line. Its object is to construct a road along the Tillamook River with a line from South Prairie slough to the headwaters of the Tillamook. The capital stock is \$100,000, and the incorporators are: Wm. Squires, B. S. Thompson and L. B. Handley. The offices will be at Trenton, Or.

Tullahoma, Elk River & Huntsville.—The company has been recently chartered. The route is from Tullahoma via Plyant Springs across Elk River at Mann's Ford, thence to Elora, Tenn., and to Huntsville, Ala. The incorporators have secured the right of way to Elk River, a distance of some 15 miles. The directors are: H. Jacobs, M. V. Staley, W. M. Staley and George A. Hawkins, of Tullahoma, Tenn.

Union Pacific.—A press dispatch from Portland, Ore., last week said that the situation of the laborers recently discharged when work was ordered suspended on the Portland & Puget Sound road was daily becoming more serious. At present there are about 1,000 in Portland, and the number is increasing. Most of them are destitute and are unable to get money on their time checks, which were due Dec. 26. A large number is being fed and lodged by the city. Owing to the inability of J. H. Smith & Co., who had the contract, to secure money due

them from the Union Pacific the men are being put off from day to day, and they are growing desperate. Some are discounting the time checks at 50 per cent.

Wheeling & Lake Erie.—The contractors laid 200 yards of track inside the corporation limits of Martin's Ferry, O., on Jan. 1, completing its line to that point ahead of contract time. The city contracted to pay the company \$10,000 provided trains were running into the city on that date, and the most strenuous efforts have been made to complete the contract; the company now has its tracks connected with the viaduct of the Wheeling Bridge & Terminal Co., and has a completed line from Toledo, O., to Wheeling, W. Va. The work on the Wheeling extension was commenced Nov. 9, and seven miles of track and four bridges were built between that date and Jan. 1.

GENERAL RAILROAD NEWS.

Beech Creek.—A lease conveying the road, with all its appurtenances, etc., to the New York Central & Hudson River Railroad for 999 years was filed in the Recorder's office of Centre County, Pa., Jan. 3. In acquiring the railroad, the New York Central Company bought the \$5,000,000 of capital stock outright for cash. This stock will be reissued with the Central's guarantee of four per cent. dividends upon it. Of the \$5,000,000 of stock \$1,300,000 is preferred. The Central will also guarantee four per cent. interest on the \$5,000,000 of bonds.

Boston & Lowell.—At the annual meeting in Boston, Jan. 7, it was voted to authorize the directors to issue bonds of the corporation not exceeding \$14,000,000, payable 40 years from April, 1892, at a rate of interest not exceeding seven per cent., and to dispose of the same for the purpose of retiring the seven per cent. bonds of the corporation to an equal amount coming due on that date.

Decatur, Chesapeake & New Orleans.—In the United States Circuit Court, at Nashville, Tenn., Jan. 5, in the case of the American Loan & Trust Co. against the railroad company, Judge Jackson ordered the road to be sold, and decreed that intervening creditors shall turn over the property attached in the State suits as a condition of intervening in this suit.

East Tennessee, Virginia & Georgia.—The company has filed a mortgage in Knoxville, Tenn., given to the Central Trust Co., of New York, for \$15,000,000. The funds are to be used to build extensions and branches, and to double track portions of the main line. It also provides that the funds may be used to retire the bonds issued in 1887. The bonds run 50 years with interest at five per cent. in gold.

Knoxville Southern.—It is understood that a satisfactory arrangement has been made between the company and its creditors. The road has \$250,000 in Knoxville city bonds and other collateral to pay debts of less than \$75,000. Owing to the monetary stringency the company has not been able to raise money, but expects to do so in the near future. The creditors have agreed not to press their claims at the present.

Lehigh Valley.—For extensions and improvements just completed the road has just sold \$3,000,000 of 4½ per cent. mortgage bonds, which mature in 1923. The company has outstanding about \$2,500,000 of 6 per cent. irredeemable bonds, and this is the second lot offered.

Louisville & Nashville.—The directors have declared a cash dividend of 2½ per cent. from the earnings from the last six months of 1890, payable on Feb. 5. This dividend is taken as meaning the abandonment of the policy of issuing scrip for dividends, the recent declarations having been largely in scrip. The financial statement of the six months shows a surplus after charges and dividends of \$389,524.

Louisville Southern.—The case of this company against the Louisville, New Albany & Chicago, came up before Judge Jackson at Nashville this week, on a motion to appoint a receiver. This case grows out of the lease by the Louisville, New Albany & Chicago road of the Louisville Southern. The former road asks in a counter suit to have a receiver appointed for the Louisville Southern, which was recently leased to the East Tennessee, Virginia & Georgia, during pending litigation.

New Castle & Beaver Valley.—At Youngstown, O., a decision was given this week in the case of this company against the Pennsylvania Company, by Judge Johnson, in the Mahoning Court of Common Pleas. The plaintiff sued to recover \$300,000 on leases and damages by the construction of defendant's river division and the diversion of the Pennsylvania traffic. The Court decided that defendant must pay rental up to the time the river division was placed in operation, and a proportionate amount for track rights. Judgment was given for \$119,202.

New York Central & Hudson River.—The gross earnings of the company for December, 1890, were \$3,083,956, an increase of \$102,425 over the same month of 1889. For the quarter ending Dec. 31, 1890, the gross earnings were \$9,462,456, showing a decrease of \$68,799 from the same period of last year. The gross earnings for the six months ending Dec. 31, 1890, were \$18,526,691, a decrease over the corresponding half-year of 1889, of \$749,763.

Oregon Improvement Co.—J. C. Haines, as attorney for the Farmers' Loan & Trust Co. of New York, has filed a suit in the United States District Court in Seattle, Wash., to foreclose the mortgage held by that company against the Oregon Improvement Co. of \$4,500,000.

Quebec's Railroad Subsidies.—The amounts voted to railroad companies as subsidies by the Quebec legislature during the session just closed reached \$2,544,000 in cash and 6,000,000 acres of land. Under the statute the land subsidies are commutable at the rate of 35 cents per acre, which therefore makes the total money liability \$4,644,000. The proposed length of the subsidized lines is about 1,000 miles. The cash subsidy is distributed as follows: St. Lawrence & Adirondack, \$70,400; Canada Atlantic, \$200,000; Drummond County, \$50,000 for construction of bridges; Great Northern, bridge at Grand Casapedia River, \$50,000; Lower Laurentian, \$165,000; Hereford, \$54,000; Lachine & Hochelaga, \$48,000; Quebec & Lake St. John, \$150,000; Lake Temiscamingue Colonization, \$147,600; Vaudeuil & Prescott, \$37,500; Quebec & Boston Air Line, \$300,000; Cap Rouge & St. Lawrence, \$28,800; St. Chrysostome Bridge, on the Richelieu River, \$50,000; Montreal & Sorel, \$150,000;

Orford Mountain, \$57,750; Portage Fort & Bristol Branch, \$150,000; Montfort Colonization, \$67,200; Arthabaska & Wolfe Counties, \$192,000; Montreal Bridge, \$10,000; Phillipsburg Quarries Junction, \$25,720; Quebec, Montmorency & Charlevoix, \$240,000; and Pontiac & Renfrew Massawippi, \$80,000.

The land subsidies were: United Counties, 600,000 acres; Drummond County, 500,000; Great Northern, 400,000; Baie des Chaleurs, 600,000; Lower Joliette & St. Jean de Matha, 80,000; Napierville Junction, 150,000; Quebec & Lake St. John, 330,000 and 450,000; Lake Temiscamingue Colonization, 250,000; Lake St. Francis Railway & Navigation Co., 200,000; Matane, 300,000; St. Chrysostome, 300,000; Lotbiniere & Megantic, 250,000; East Richelieu Valley, 250,000; Pontiac & Renfrew, 50,000, and Quebec & Oriental, 1,000,000.

Rutland.—The Central Vermont's new lease of this road is for 999 years, with an annual rental of \$345,600 and taxes, the Rutland road to furnish \$500,000 at five per cent. interest for improvements. The lessee has the option of purchasing at any time a controlling interest in the stock of the Rutland line. In addition, the Central Vermont secures an important traffic arrangement with the Delaware & Hudson Canal Co., by which it will gain a large amount of freight traffic.

St. Louis, Iron Mountain & Southern.—The principal of the first mortgage seven per cent. bonds of the Cairo & Fulton, of which there are over \$7,100,000, was payable Jan. 1, but the company has extended the date six months, taking advantage of a clause in the mortgage. The St. Louis, Iron Mountain & Southern has been attempting to secure an exchange of the Cairo & Fulton bonds for the general consolidated five per cent. bonds of the former company in accordance with a general refunding scheme. About \$2,000,000 Cairo bonds have been exchanged for the new Iron Mountain five per cent., although the holders of from \$2,000,000 to \$3,000,000 bonds have expressed their willingness to make the proposed exchange.

Wabash.—The controversy between the Chicago & Erie and the Wabash roads over the use by the latter of the former's tracks for reaching Chicago has been amicably settled. It began by the Erie's termination of the contract a few months ago and a refusal to renew it. Litigation followed, by which the Wabash sought to preserve the right to use the tracks and terminal facilities of the Chicago & Western Indiana, by which actual entrance is obtained to Chicago by the Chicago & Erie and other roads. The Wabash and the Erie officers have agreed to a new contract under which the former pays an increased rental to the Erie. All litigation is to be abandoned. The new contract is to run for 18 months from Jan. 1. Before that time expires the Wabash expects to have its independent western extension to Chicago completed.

TRAFFIC.

Chicago Traffic Matters.

CHICAGO, Jan. 7, 1891.

The interest of Chicago officials centers this week in the meeting to be held at New York to-morrow. The vice-presidents and managers of several of the Chicago lines have been at work for a week or more on the details of a new agreement which they will submit to the meeting, and which they would like to see adopted. It is understood that if adopted the plan proposed will radically change the present forms of Association methods. Considerable uneasiness is felt as to the outcome of the Omaha bridge trouble between the Union Pacific and the Chicago, Milwaukee & St. Paul and the Chicago, Rock Island & Pacific, and its probable effect upon the meeting. Presidents Cable and Miller both left for New York in advance of the other presidents, and it is surmised for the purpose of coming to some understanding in regard to this matter before the meeting convenes. Should no settlement be reached, it is probable that both roads may decline to become parties to any agreement with the Union Pacific, on the ground that if the latter proposes to break its contracts with the other lines in regard to operating details, no contract or agreement in regard to rates is possible. On the other hand, the necessity of carrying the new agreement through on account of the financial necessities of the time may outweigh any factional disputes, and leave these matters to be settled outside.

Word has been received here that the Chicago & Erie and the Wabash have reached a settlement in regard to the trackage contract, and that the Erie will permit the Wabash to use its tracks from Hammond to Laketon Junction as heretofore. Wabash officials in this city are not informed whether this is a temporary arrangement, or a renewal of the old contract.

Superintendent Carman, of the Western Railway Weighing Association and Inspection Bureau, has issued a notice to the lines in the Association asking them to call the attention of their agents at points provided with track scales to the importance and necessity of weighing all cars passing their stations the way bills of which do not bear impression of the weight stamp and weights of the Association.

The Missouri, Kansas & Texas has given notice of the cancellation of rates and divisions with the Texas & Pacific on all freight, except cotton to or through New Orleans, on account of the demand of the latter company for increased divisions.

As an indication of the retrenchment policy to be pursued by the Western lines the coming year, I may note the discontinuance of many of the Eastern agencies of the Chicago, St. Paul & Kansas City, and the recent action of the Wabash in abolishing its commercial agency at St. Joseph, Mo., and the transfer of the work of that office to the general offices.

The Illinois Central will put on its new Chicago & New Orleans limited Jan. 11, leaving Chicago at 3:30 p. m., arriving at New Orleans at 8 p. m. the following day. This is about seven hours faster time than has heretofore been made between these cities.

The Jacksonville Southeastern line admits selling mileage tickets at two cents a mile to be used to cut rates from St. Louis to Chicago. Chairman Finley has authorized the Chicago & Alton, the Wabash and the Illinois Central to make a rate of \$5.75 from St. Louis to Chicago to meet the scalpers' rates over the Jacksonville Southeastern and the Atchison. This is a reduction of \$1.75 from the regular rate. The reduction applies in one direction only, and there is no evidence that the rate from Chicago to St. Louis has been manipulated.

The Board of Apportionment, controlling the movement of traffic in the Southwestern Missouri River Territory, has issued another order for a diversion of carload freight. The Atchison is ordered to divert 600 cars; 200 to the Rock Island, 100 to the Wabash, and 300 to the Alton. The Burlington is ordered to divert 300

cars; 150 to the Rock Island and 150 to the Wabash. The Chicago, Milwaukee & St. Paul is also ordered to divert 100 cars to the Wabash. Immediate compliance is requested. The Board also gives notice of the suspension of its order requiring the Chicago, St. Paul & Kansas City to make diversions, on the ground that it appears that that line has largely withdrawn from eastbound traffic, thus tending to equalize its percentages.

A comparison of the eastbound carload movement of freight at lower Missouri River points, for the months of December 1889 and '90, shows the following:

Line.	December, 1889.		December, 1890.	
	Carloads.	Per cent.	Carloads.	Per cent.
C. & A.	2,667	13.3	1,204	16.3
C. B. & Q.	1,873	9.3	881	12.
C. M. & St. P.	2,110	10.5	832	11.3
C. R. I. & P.	1,542	7.6	580	7.9
A. T. & S. F.	3,447	17.1	1,633	22.4
C. St. P. & K. C.	1,511	7.5	62	.8
Wabash.	3,259	16.2	483	6.5
Mo. Pacific.	2,250	11.1	1,148	15.5
K. C., F. S. & M.	1,482	7.4	537	7.3
	20,121	100.	7,383	100.

The large decrease in tonnage is accounted for principally by the heavy movement of corn a year ago. A comparison by commodities gives the following figures:

	December, 1889.		December, 1890.	
	Carloads.	Car loads.	Car loads.	Car loads.
Wheat.	1,196	934		
Corn, rye and oats.	13,935	536		
Bran, mill feed, flour.	402	263		
Meat, tallow and lard.	799	1,225		
Dressed beef, hogs and mutton.	798			
Horses and mules.	32	110		
Cattle.	1,883	2,126		
Hogs and sheep.	31	117		
Lead and bullion.	300	182		
Other freight.	725	969		
	20,121	7,383		

The arbitrators selected to hear and determine the question of the right of the Atchison to have the mileage ticket question arbitrated have decided that the Atchison is right in its position. They decided that while the agreement of the Western Passenger Association provides that an aggrieved party may appeal to the Association or to arbitration, yet it should not be construed that a road having appealed to the Association and not being sustained was thereafter barred from appealing to arbitration. The whole matter will therefore be argued before the same arbitrators upon an appeal from the ruling of the Association.

Traffic Notes.

During the month of November last the Cleveland, Cincinnati, Chicago & St. Louis delivered the eastbound "Southwestern limited" train to the Lake Shore & Michigan Southern with an average of 54 through passengers a day, and this was only an average month.

Second-class passenger fares from the Missouri River to points to Utah were advanced on Jan. 1 from \$25 to \$30. Salt Lake City people complain at this, the rates to Montana points having been reduced and the second-class rate to California being only \$5 more than to Utah.

Notice has been issued at Cincinnati that after Jan. 14 the roads centering in that city will refuse to receive package freight in less than carloads unless the destination is shown in full on each package. It will not be astonishing if there is an occasional suspension of this rule.

On Jan. 3 the Boston & Maine made another reduction of 75 cents in the second-class passenger fare from Boston to Chicago, bringing the rate down to \$11.75. It is said that this rate is quoted via Albany and Binghamton, and that the rate for similar tickets from Albany is \$15, thus constituting a violation of the Interstate Commerce law.

The Iowa Railroad Commissioners have decided to adopt the proposed uniform classification with the reservation "that in case any interest in the state is injuriously affected by the classification of any product of the soil or article of merchandise or manufacture, the Commissioners reserve the right to take the particular article from the general classification and give it a commodity rate."

It is announced that the Western & Atlantic will hereafter run at least three passenger cars on each passenger train, a smoking car and two first-class coaches, one each for whites and blacks. The middle car will be assigned to negroes and smoking will not be allowed in it. This car will be "exactly the same as the other first-class coach."

The Interstate Commerce Commission has denied a rehearing in the case of Proctor & Gamble against the Cincinnati, Hamilton & Dayton and others. The original decision was in favor of the complainants, holding that soap should be billed at net instead of gross weight, that having been the custom previous to the enactment of the Interstate Commerce law, and the railroads had asked to have the case reopened.

East-bound Shipments.

The shipments of east-bound freight from Chicago by all the lines for the week ending Saturday, Jan. 3, amounted to 77,397 tons, against 71,900 tons during the preceding week, an increase of 5,497 tons, and against 112,500 tons during the corresponding week of 1889-90, a decrease of 35,103 tons. The proportions carried by each road were:

	Wk. to Jan. 3.		Wk. to Dec. 27.	
	Tons.	P. c.	Tons.	P. c.
Michigan Central.	10,995	13.7	9,040	12.6
Wabash.	6,282	8.1	6,967	9.7
Lake Shore & Michigan South.	10,825	14.0	12,450	17.3
Pitts., Ft. Wayne & Chicago.	7,419	9.7	7,412	10.3
Chicago, St. Louis & Pitts.	9,212	11.7	8,622	12.0
Baltimore & Ohio.	4,622	6.0	4,764	6.6
Chicago & Grand Trunk.	10,011	13.0	8,223	11.4
New York, Chic. & St. Louis.	8,557	11.1	8,169	11.4
Chicago & Erie.	9,784	12.7	6,253	8.7
Total.	77,397	100.0	71,900	100.0

Of the above shipments 6,249 tons were flour, 41,709 tons grain, 3,471 tons millstuffs, 4,169 tons cured meats, 3,160 tons lard, 6,321 tons dressed beef, 1,282 tons butter, 1,839 tons hides, 110 tons wool, and 4,718 tons lumber. The three Vanderbilt lines together carried 38.8 per cent. while the two Pennsylvania lines carried 21.4 per cent.